REPORT ON

PETROLEUM CONTAMINATION INVESTIGATION

JOHNSON & DIX FUEL CORPORATION
WHITE RIVER JUNCTION, VERMONT

1/14/92

Submitted by
Dufresne-Henry, Inc.

January • 1992

DH Dufresne-Henry

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Engineering Disciplines
Civil
Environmental
Transportation
Municipal
Structural
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Construction Management
Applied Sciences
Water Quality
Geologic
Hydrologic
Computer

January 14, 1992

Mr. Richard Spiese
State of Vermont
Agency of Natural Resources
Hazardous Materials Management Division
103 South Main Street
Waterbury, Vermont 05676

Re: Johnson & Dix Fuel Corporation, White River Junction Vermont
D-H #160017

Dear Mr. Spiese:

On behalf of Johnson & Dix Fuel Corporation, Dufresne-Henry submits this final report for work completed at the Bridge Street Bulk Storage Facility in White River Junction, Vermont.

This report has been compiled based on the work plan submitted to the Agency on July 3, 1991.

We anticipate moving ahead with the recommendations included in this report directly. Therefore, your timely review is requested. If you have any questions or comments regarding this submittal, please feel free to call.

Respectfully submitted,

DUFRESNE-HENRY, INC.

Theodore S. Reeves, P.E.
Environmental Services Division

Approved:

C. Jonathan Manning, P.E.
Vice President

TSR/CJM/rmn
Attachments
01141330.n

CHAPTER 1

INTRODUCTION

The State of Vermont Hazardous Materials Management Division Sites Management Section (SMS) was involved in the removal of two underground storage tanks at the Bridge Street Bulk Storage Facility in White River Junction, Vermont, in late 1989. As a result of the UST removal, two groundwater monitoring wells were installed in January 1990. Subsequent groundwater samples indicated the presence of gasoline constituents in the groundwater. The SMS therefore requested Johnson & Dix to perform a site evaluation to determine the extent and source of the gasoline plume. Dufresne-Henry was retained by Johnson & Dix Fuel Corporation to complete the evaluation.

The Johnson & Dix facility has been in operation as a bulk petroleum storage facility for over forty years. The facility was originally owned and operated by Sanborn Oil Company of White River Junction. It is located in the heart of the Village of White River Junction. The facility is located on the south bank of the White River, approximately 1/2 mile from its confluence with Connecticut River. The surrounding area is in commercial and industrial use being bounded by the Boston and Maine Railroad to the south; Bridge Street, the Hartford Water Department Garage and a shop/warehouse facility to the east; a vacant lot to the west; and the White River to the North. A Site and Locus Plan indicating the general site location and monitoring well locations is attached to this report as Appendix A.

Significant features of the Bridge Street facility include a concrete containment structure which surrounds six aboveground storage tanks for petroleum products; an overhead loading rack for transfer of product from the tanks to transport vehicles; an "auto-fuel" system for customers to fuel their vehicles (located at the southeast corner of the aboveground tank containment area); and an office/garage building. The majority of the site is paved with the exception of the area to the west of the containment structure and the area between the office building and the White River.

The site is located within the 100 year flood limits and was formed by fluvial deposits of soil. Since the site is developed it has been filled and graded several times. The railroad sits on an embankment which forms the southern edge of the property, and effectively isolates the facility from the remainder of the Village.

CHAPTER 2

MONITORING WELL INSTALLATION

In December 1990, five shallow groundwater monitoring wells were installed by Kennedy Drilling under the supervision of Dufresne-Henry, Inc. These wells were located in an array to attempt to identify hydrogeologic conditions, soil characteristics, the source of product, and areal extent of the plume. The wells were installed using hollow stem augers driven by a truck mounted drill rig. Soil samples were obtained using a split spoon sampler at five foot intervals during the installation of all wells. The wells installed during this period were designated monitoring wells #3 through #7.

All of the wells were constructed within the hollow stem of the auger, prior to the auger being withdrawn from the soil. The wells were constructed using two inch PVC screen and sleeve, with flush joints. The borehole was filled using silica sand around the screened section of the well and a bentonite clay seal was installed at the top of the sand pack to prevent surface water infiltration. Each well was capped with a "Buffalo" box grouted at the surface. The wells were installed such that the prevailing groundwater bisected the ten foot screen section of the well. Soil boring logs and field logs are attached to this report as Appendix B.

During monitoring well installation, an HNU PI-101 photoionization detector (10.2 eV lamp) was used to scan soil samples from the auger flights and split spoon. Readings from the HNU were documented in the boring logs.

After the initial set of wells was installed, groundwater samples were collected and analyzed for volatile organic compounds. A plume of gasoline and oil products was identified on the site. As a result of this work, completed in the Spring of 1991,

Dufresne-Henry supervised installation of four additional groundwater monitoring wells, and a four inch recovery well on the site. The wells were installed using the same methodologies as previously described. The recovery well was installed last, at a location determined from the field work completed during the winter and spring of 1991, and field observations during installation of monitoring wells #8 through #11.

Generally, all of the monitoring wells are on the order of 15 to 25 feet in depth.

CHAPTER 3

FIELD MONITORING AND SAMPLING ACTIVITIES

After completion of the monitoring well installation, a field location and topographic survey was completed by Dufresne-Henry personnel. This survey included the immediate area of the Bridge Street facility. Items included in the survey are the office/garage building, monitoring well locations, the overhead loading rack, aboveground tank locations, and significant site features such as the railroad embankment.

On July 31, 1991, groundwater samples were collected from the monitoring and recovery wells located at the Bridge Street facility. The groundwater sampling was conducted in accordance with our work plan submitted to the SMS on July 3, 1991 (attached as Appendix C). These samples were preserved in a cooler with ice, and shipped via overnight courier to Eastern Analytical, Inc. for analysis for volatile organic compounds (VOC's) by EPA method 601/602/8015. After these samples were received by Eastern Analytical, they were placed in a refrigerator for storage until the requested analysis could be performed. We were notified by Eastern Analytical on August 9, 1991 that the samples stored in the refrigerator had frozen and broken. Therefore, Dufresne-Henry personnel resampled the wells on the site on August 13, 1991, and again forwarded the samples to Eastern Analytical.

During both sampling events, samples were not obtainable from monitoring wells #3, #4, #5, #6, and #7 (all installed December 1990) because the groundwater level had dropped below the bottom of the well.

During the sampling events, groundwater was measured prior to sampling the well. The data gathered during this portion of sampling assisted in developing groundwater contour mapping, and in plume identification mapping. A groundwater contour map; a map identifying total benzene, toluene, ethylbenzene, and total xylenes (Total BTEX) plume; and a map identifying the total volatile petroleum hydrocarbons (TVPH) plume are attached to this report as Appendix D.

The water quality analysis results are attached to this report as Appendix E. Completed analysis results for samples collected on January 3, 1991 from monitoring wells #1 through #7 are also attached for reference. The results of these samples were used to generate the TVPH and Total BTEX maps. Please note that the TVPH and BTEX plots were compiled using information from the January and August, 1991 sampling events.

CHAPTER 4

SITE GEOLOGY AND HYDROGEOLOGY

The borings completed on this site indicate that the involved area has been graded, and portions of the site filled to provide a level area. Typically, the soils on the site are gray loose sandy silts. Soil samples were collected during installation of the recovery well, and sent to Soils Engineering in Charlestown, New Hampshire for sieve analysis. The analysis revealed that the soil is a fine sand/silt with 89% passing a #100 sieve and greater than 50% passing the #200 sieve. This soil type prevails until approximately 20 feet below the surface where the soil is a poorly drained, dense gravelly sand. The soil boring logs also identify fill material in some borings to a depth of approximately three feet.

The major hydrogeologic feature of the site is its proximity to the White River. Groundwater sampling that occurred during the summer of 1991 demonstrated that the prevailing groundwater table at the site is greatly influenced by the level of the river. During the draughty summer of 1991, the water level in the White River was lowered significantly. Our field work during this same period showed the groundwater table to be below the bottom of several of the monitoring wells located on the site. For instance, monitoring well #5 had dropped over 3.4 feet between the sampling events in January and July, 1991.

Due to the incomplete nature of the information obtained during the summer monitoring well sampling, an additional round of well soundings was completed on November 1, 1991. These soundings better identified the groundwater flow direction and contours on the site. Generally, flow across the site is from the southwest to the

northeast (from monitoring well #8 toward monitoring well #11). As groundwater flow approaches the White River, it is influenced by, and moves more directly toward, the river. However, soundings taken during July and August, 1991, and again in November 1991, show that the groundwater gradient did exhibit a slight seasonal variation. The flow direction was more towards the north during the summer months than it was in November.

CHAPTER 5

RESULTS

The groundwater analysis results completed during January 1991 and August 1991 confirm that a release(s) of petroleum product has occurred on this site.

The analytical results from the samples collected in January, 1991 indicate total a strong presence of BTEX in monitoring wells #1, #3, and #5 which is typical of gasoline presence. Significant concentrations of TVPH (C3-C16 carbon molecule range) typical of diesel fuel, kerosene, or #2 fuel oil are also found in monitoring wells #3 and #5. Samples collected from monitoring wells #2, #4, #6, and #7 had little or no product present in them. Combined these results indicate a strong gasoline presence in monitoring well #1, a mix of oil and gasoline in well #3, and a presence of gasoline with heavier oil impact in well #5. A summary table for these results is attached as Appendix F.

The analysis completed on the samples gathered in August of 1991 indicated that the area around monitoring well #1 continues to exhibit the presence of primarily gasoline contamination with some heavier carbon molecules present. The remaining deeper wells which could be sampled during this round of collection are generally on the periphery of the site and showed reduced or no presence of petroleum product.

The area around monitoring well #3 exhibits the greatest concentrations of all product, and when sampled on January 3, 1991, had 2 1/2 inches of free product. This product appeared to be an oil/gasoline mix. The free product found in monitoring well #5 at that same time appeared to be a more oily type residual.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

From the field and analytical work completed to date, it is clear that a petroleum plume(s) exist on this site. The release is fairly well defined and localized. The greatest concentrations of all products is in the vicinity of monitoring wells #1, #3, #5 and the recovery well. An upgradient well (#8) does not appear to be involved at this time. Downgradient wells (#4, #7, #9 and #11) have had only small dissolved amounts or no product evident in collected groundwater samples.

Information gained to this point supports the conclusion that two overlapping plumes may exist on the site; one of gasoline, and one of oily product (#2 fuel oil, diesel fuel, kerosene type products). However, they are both involved in the central portion of the site, around monitoring wells #3, #5 and the recovery well.

The tank removal form completed by Patrick Coyne of the SMS for the two underground tanks indicated that when the two 2,000 diesel tanks were removed in 1989, soil contamination with diesel product (or similar) was present. Monitoring well #8 was installed with the express intent of trying to identify the possibility that these tanks were partially responsible for the presence of product on the site. MW #8 was installed only a few feet from the tank excavation according to the site sketch completed by Mr. Coyne at the time of the tank pull. To date, MW #8 has not shown any presence of product. Presence of petroleum product is not detected until it appears in the downgradient wells #1 and #3. Plume mapping confirms the highest concentrations exist immediately downgradient of the former UST site. Therefore, it is our conclusion that the former

UST's are responsible for a release of product. However, we cannot conclude that it they are the sole source of product on this site.

We have discussed with Johnson & Dix at length the need to continually review their operations at this site to minimize the potential release of product, especially from the self serve "auto fuel" dispensing station. Johnson & Dix has had the underground piping from the aboveground tanks to the loading racks pressure tested, and they have passed these tests.

Dufresne-Henry has recommended to Johnson & Dix that an additional round of samples be collected during the next few weeks to attempt to gain a clearer picture of the plume characteristics and location at that time. Also, groundwater soundings should be completed at the time of this sampling and the groundwater contour map revised.

Possible Remediation

Dufresne-Henry, in conjunction with Windham Environmental Associates has used the work completed to date to begin development of remediation plans for this site. Possible remediation technologies include soil venting, free product recovery, free product recovery with vacuum enhancement, and dissolved product treatment.

Remediation of adsorbed material is proposed to be completed by a soil venting system. The permeability of the soil, which may hinder free product recovery by pumping technologies, will not necessarily hamper treatment by soil venting. Secondarily, the air changes within the soil structure will assist with aerobic biodegradation of the product in-situ. A small scale soil vent treatment system is proposed for installation at this site to document the applicability of the soil vent system for treatment of the adsorbed product. With documented success from this unit, the soil vent system can be expanded

to include the entire site if needed. Soil venting should reduce the dissolved BTEX on the site.

Free product has been observed on this site. However, due to the tight soil characteristics and the generally limited area of free product, we do not believe that free product recovery alone will result in a large quantity of material actually being recovered. The quantity of recovered product versus the effort expended would be low. The capillary action of the fine grained soils act to hold the product in the soil pore spaces making free product more difficult to remove. To overcome the surface tension between the product and soil pores, vacuum enhanced free product recovery may be of use. This would require addition of vacuum equipment on the recovery well(s) to assist in breaking the bond between product and the soil pores.

Anaerobic degradation is also likely to occur. Both aerobic and anaerobic degradation are measurable in the soil vent system off gases as methane and carbon dioxide. Other methods for tracking the success of biological degradation of product in-situ is by microbiological assays and quantitative analysis.

Dissolved product remediation (dissolved BTEX) is not proposed at this time for this site since the effort required versus expected mass recovery would likely be small. In addition a system for dissolved product recovery/and or treatment would entail a high initial investment, and high operation and maintenance costs.

Recommendations

Complete an additional round of sample collection from the groundwater monitoring and recovery wells on the site. Additional analysis should be completed by EPA methods 601/602/8015 for BTEX, MTBE, and TVPH. Additional groundwater

soundings should also and the groundwater contour, BTEX and TVPH maps will be revised.

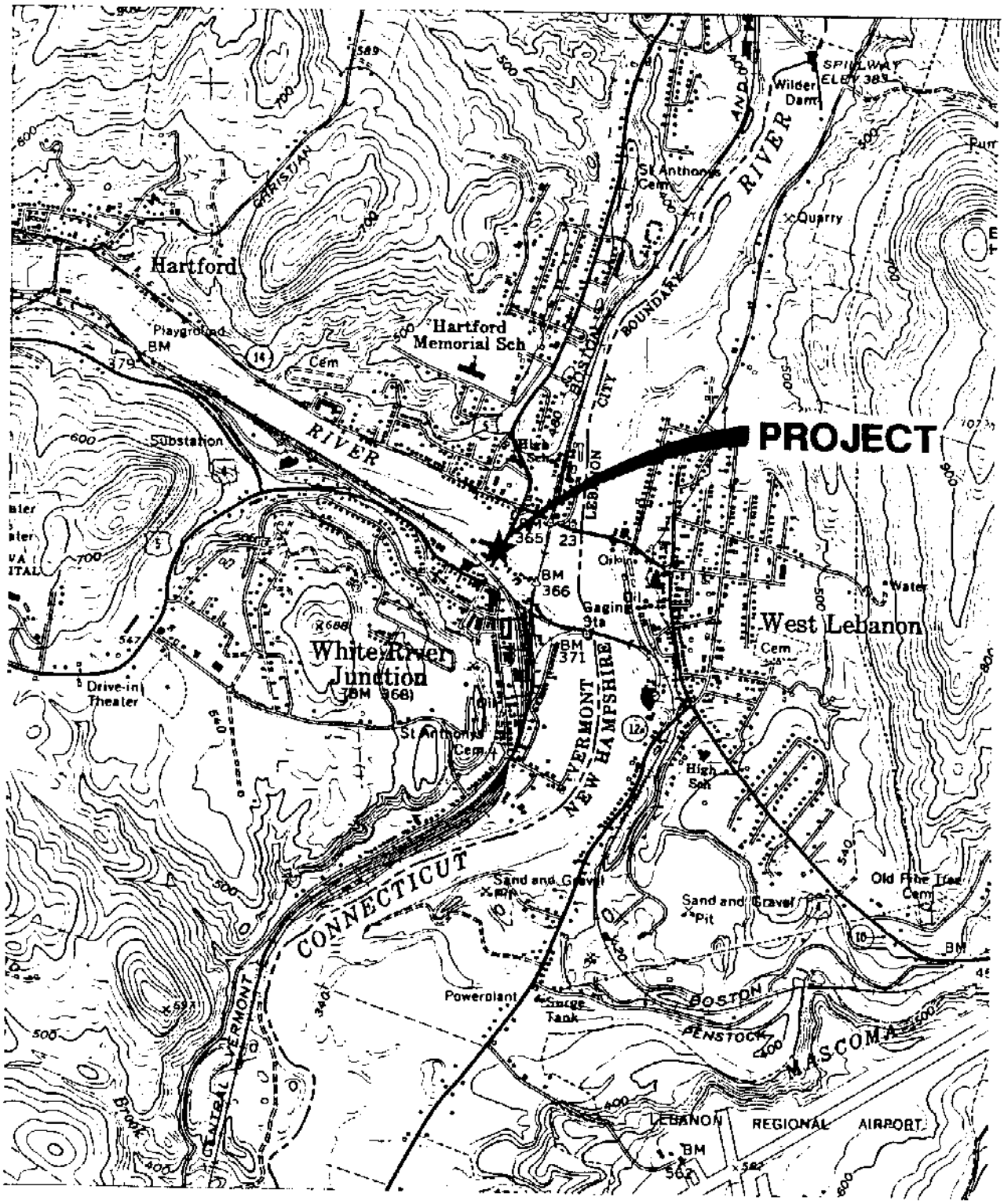
Dufresne-Henry in conjunction with Windham Environmental Associates recommend installation of a small scale soil vent system. After demonstrated success of this system, it can be expanded (if required) to service the entire plume area. The soil vent system's effectiveness will be measured by vacuum drawdown on surrounding wells, and analysis of system off gases. The fact that the majority of this site is paved will benefit the operation and effectiveness of this system.

Should the effectiveness of the soil vent system be found to be limited, a free product recovery system will then be pilot scale tested. With the soil vent equipment on-site, it may be possible to supplement the pilot scale free product recovery system with vacuum enhancement.

Dufresne-Henry will work closely with the Sites Management Section throughout investigation of the small scale soil vent system.

APPENDIX A

LOCUS AND SITE PLANS



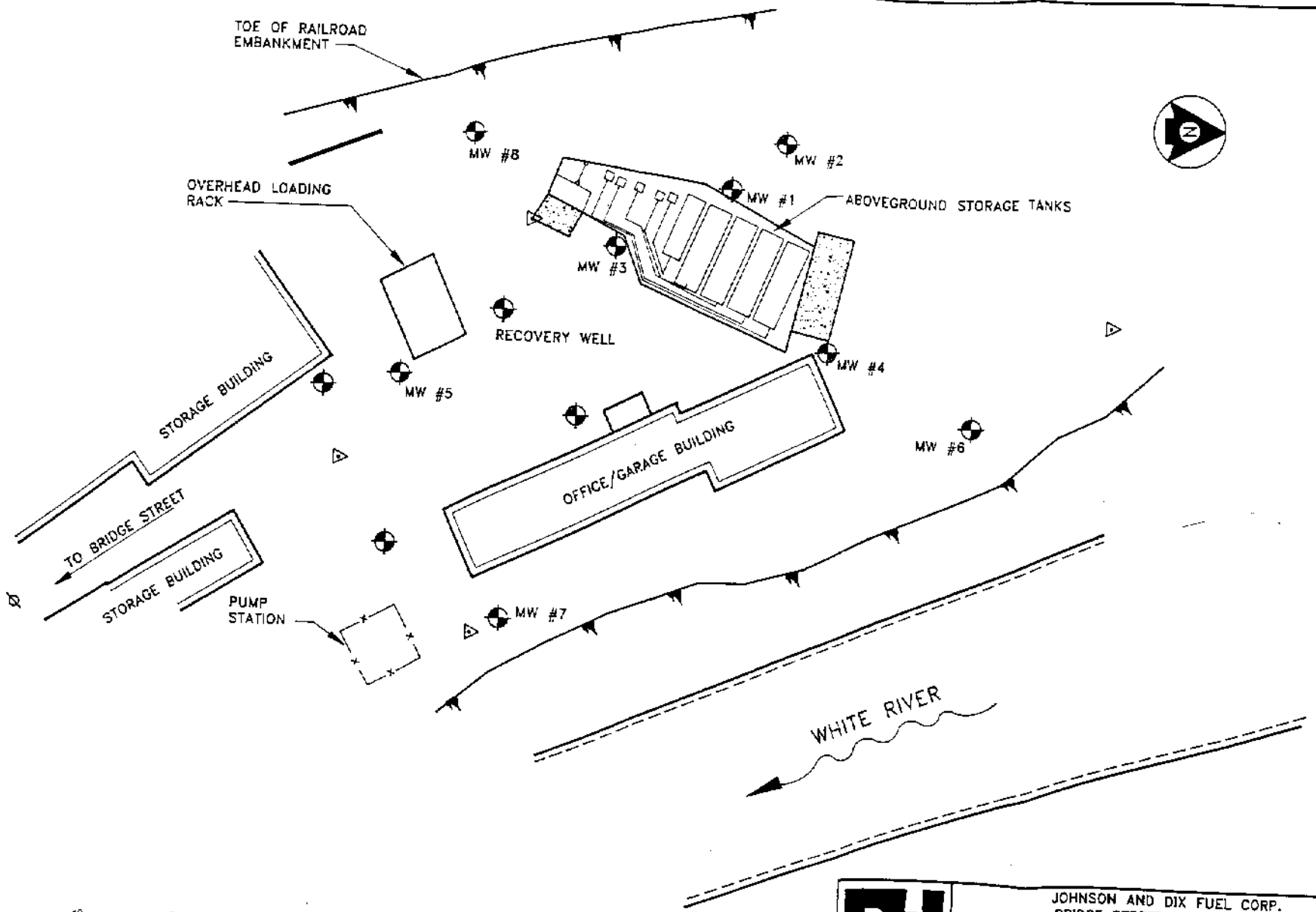
VICINITY MAP

1" = 2000'

Client No.	161005	JOHNSON & DIX FUEL CORPORATION	
Proj. Mgr.	TSR	LOCATION MAP	
Date	5/91	WHITE RIVER JCT., VERMONT	A 6997

Duffemeo-Henry Inc.
Precision Park
No. Springfield, Vermont 05150

BRUNING 44-232 45337-13



Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150

JOHNSON AND DIX FUEL CORP.
BRIDGE STREET BULK FACILITY

SITE PLAN

WHITE RIVER JUNCTION, VERMONT

Client No. 160017 | Proj.Mgr. T.S.R. | Date 12/91 | 6

APPENDIX B

BORING LOGS

BORING LOCATION MW 3 INCLINATION V BEARING DATE START/FINISH 12/26/90 / 12/26/90

CASING ID CORE SIZE TOTAL DEPTH 21.5 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (AD) 499.10 DEPTH TO WATER/DATE 13± FT/ 1/3/91 LOGGED BY: B. COX

ELEV AD FT	SAMPLE DEPTH FT	TYPE AND NO.	B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
494.60	4.5						4 1/4" HSA	8"/FB	0" - 3"± Bituminous pavement. 3" - 1'6"± SAND and GRAVEL subbase. 1'6" - 4'6" SAND and GRAVEL. At 2'± dark brown gravelly sand with strong fuel oil odor. At 3'± hard drilling. Brick fragments from auger flights.
492.60	6.5	SS 1	7 3 2 2	2	24	24			Light - medium gray, very loose - loose, silty SAND. Very fine - fine grained sand. 20% - 30% non plastic fines. Slightly moist. Slight, but noticeable, fuel oil odor. 45 ppm.
489.60	9.5						4 1/4" HSA	8"/FB	At 8'± a layer of saturated sand (very oily) then dryer.
487.60	11.5	SS 2	3 2 1 3	2	24	24			Medium gray, very loose - loose, silty SAND. Very fine - occasionally fine grained predominately quartz sand. 40%± non plastic fines. Occasional sandy layers. Trace mafic minerals, mica. Slightly moist. Strong fuel oil odor. 140 ppm.
484.60	14.5						4 1/4" HSA	8"/FB	
482.60	16.5	SS 3	1 2 3 1	2	24	24			Medium gray, very loose, silty SAND as above. Saturated. Strong fuel oil odor. 150 - 160 ppm.
479.60	19.5						4 1/4" HSA	8"/FB	Denser at 17'±.
477.60	21.5	SS 4	10 15 21 23	2	19	24			19'6" - 20' Dark brown coarse grained SAND. 20' - 21'6" Dark gray, dense/hard, slightly clayey SILT. Slightly plastic fines. Rapid dilatancy reaction. Saturated. Oily odor top 6"±, then little. 8 - 10 ppm from bottom.
									No refusal to depth. Set 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC at 19'6". Sand backfill to 7'. Bentonite seal 4'4" - 6' (hole caved 1'). Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger
FB = Finger Bit
ppm: Refers to HNU reading (10.2 eV probe)
Depth to water from top of PVC

Johnson & Dix
White River Junction Bulk Facility
Hartford, Vermont
DATE: 12/26/90 PROJECT: 160017

LOG OF BORING: MW 3

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 4 INCLINATION V BEARING DATE START/FINISH 12/26/90 / 12/26/90

CASING ID CORE SIZE TOTAL DEPTH 16.5 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (AD) 498.36 DEPTH TO WATER/DATE 12.5 FT/ 1/3/91 LOGGED BY: B. COX

ELEV AD FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
493.86	4.5						4 1/4" HSA	8"/FB	0" - 3"± Crushed stone driveway. 3" - 1'6" Dark brown SAND. 1'6" - 2'6" Light brown very fine - fine grained SAND. 2'6" - 4'6" Medium brown SAND as above. Slightly gravelly bottom 1'±.
491.86	6.5	SS 1	3 2 3 3	2	20	24			Medium gray brown, loose, silty SAND. Very fine - rarely medium grained predominately quartz sand. 20%± non plastic fines. Trace medium - dark brown organic layers upper foot. Trace mica, mafic minerals. Dry. No odor or staining. Trace ppm.
488.86	9.5						4 1/4" HSA	8"/FB	
486.86	11.5	SS 2	1 2 2 4	2	20	24			Medium - dark gray brown, very loose - loose, silty SAND similar to above. Very fine - rarely medium grained quartz sand. 20% - 30% non plastic fines. Rare, fine, medium orange oxidized lenses. Occasional brown (organic?) appearance. Wet - saturated. No odor or staining. 0 ppm.
483.86	14.5						4 1/4" HSA	8"/FB	
481.86	16.5	SS 3	1 1 1 1	2	24	24			Medium gray, very loose, silty SAND. Very fine - fine grained sand. 20% - 30% non plastic fines. Abundant (30% of area), thin (1/16"±) discontinuous dark brown and dark rust mottles, almost all horizontal. Occasional thin roots and root fillings. Saturated. No odor or staining. 0 ppm.
									No refusal to depth. Set 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC at 14'6". Sand backfill to 3'. Bentonite seal 2'3" - 3'. Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

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Depth to water from top of PVC

Johnson & Dix
White River Junction Bulk Facility

Hartford, Vermont

DATE: 12/26/90 PROJECT: 160017

PAGE 1 OF 1 LOG OF BORING: MW 4

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 5 INCLINATION V BEARING DATE START/FINISH 12/26/90 / 12/26/90

CASING ID CORE SIZE TOTAL DEPTH 21.5 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (AD) 499.36 DEPTH TO WATER/DATE 15.1 FT/ 1/3/91 LOGGED BY: B. COX

ELEV AD FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
494.86	4.5						4 1/4" HSA	8"/FB	0" - 3"± Bituminous pavement. 3" - 9"± Gravelly subbase. 9" - 4'6" Black SAND and GRAVEL fill. Occasional wood and brick fragments and metal refuse from auger flights. Occasional cobbles or rubble. Slightly moist. Fuel oil odor, occasionally strong.
492.86	6.5	SS 1	3 3 3 4	2	20	24			Medium gray, loose, silty SAND. Very fine - fine grained predominately quartz sand. 30%± non plastic fines. Trace mafic minerals, mica. Slightly moist. Moderate fuel oil odor. 12 ppm.
489.86	9.5						4 1/4" HSA	8"/FB	
487.86	11.5	SS 2	2 2 1 3	2	24	24			Alternating layers of light gray and medium gray, very loose - loose, silty SAND. Very fine - rarely medium grained sand. Layers 1" - 3"+. 20% - 30% non plastic fines. Slightly moist. Strong fuel oil odor. 80 - 90 ppm.
484.86	14.5						4 1/4" HSA	8"/FB	
482.86	16.5	SS 3	1 2 2 4	2	20	24			Medium gray, very loose - loose, silty SAND. Very fine - medium grained (predominately fine grained) sand of quartz and rock fragments. 10% - 20% non plastic fines. Saturated. Strong fuel oil/gasoline(?) odor. 100 - 110 ppm.
479.86	19.5						4 1/4" HSA	8"/FB	
477.86	21.5	SS 4	11 15 18 15	2	6	24			SAND over coarse GRAVEL/COBBLES. Saturated. Strong fuel oil/gasoline(?) odor. 70 - 80 ppm.
									No refusal to depth. Set 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC at 19'6". Sand backfill to 5'10". Bentonite seal 4'10" - 5'10". Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger
FB = Finger Bit
ppm: Refers to HNU reading (10.2 eV probe)
Depth to water from top of PVC

Johnson & Dix
White River Junction Bulk Facility

Hartford, Vermont

DATE: 12/26/90 PROJECT: 160017

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 6 INCLINATION V BEARING DATE START/FINISH 12/27/90 / 12/27/90

CASING ID CORE SIZE TOTAL DEPTH 16.33 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (AD) 496.55 DEPTH TO WATER/DATE 12.2 FT/ 1/3/91 LOGGED BY: B. COX

ELEV AD FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
492.22	4.33						4 1/4" HSA	8"/FB	SAND and GRAVEL fill with occasional cobbles or rubble.
490.22	6.33	SS 1	2 3 4 21*	2	20	24	* Cobble		Medium brown, loose, silty SAND. Very fine - predominately fine grained predominately quartz sand. 30%± non plastic fines. Trace roots, mica, and mafic minerals. Dry, except bottom 3" is wet. No odor or staining. Trace ppm.
487.22	9.33						4 1/4" HSA	8"/FB	Probable rubble to 8'±. Small pieces of metal and plastic from auger flights.
485.22	11.33	SS 2	3 13 8 4	2	13	24			Medium brown SAND similar to above. 20% - 30% non plastic fines. Gravelly middle 6" - 12". Saturated. No odor or staining. Trace ppm.
482.22	14.33						4 1/4" HSA	8"/FB	
480.22	16.33	SS 3	2 4 4 5	2	21	24			14'4" - 15'4"± Medium brown, loose, silty SAND. Very fine - occasionally medium grained sand. 20%± non plastic fines. 0 ppm. 15'4" - 16'4" Alternating layers of fine - medium grained SAND and silty ORGANIC SOIL. Decay odor, twigs. Sand has thin (1/8"±) medium - dark orange mottles. Saturated. No odor or staining. 0 ppm.
									No refusal to depth. Set 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC at 14'4". Sand backfill to 2'6"±. Bentonite seal 1'6" - 2'6"±. Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger
FB = Finger Bit
ppm: Refers to HNU reading (10.2 eV probe)
Depth to water from top of PVC

Johnson & Dix
White River Junction Bulk Facility
Hartford, Vermont
DATE: 12/27/90 PROJECT: 160017

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 7 INCLINATION V BEARING DATE START/FINISH 12/27/90 / 12/27/90

CASING ID CORE SIZE TOTAL DEPTH 16.5 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (AD) 496.71 DEPTH TO WATER/DATE 13.3 FT/ 1/3/91 LOGGED BY: B. COX

ELEV AD FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
492.21	4.5						4 1/4" HSA	8"/FB	Brown SAND and GRAVEL. Probable fill. Cobbles or rubble to 4'±.
490.21	6.5	SS 1	2 2 1 1	2	7	24			SAND, COAL, and coal CINDERS. Top wet, bottom dry. No odor.
487.21	9.5						4 1/4" HSA	8"/FB	
485.21	11.5	SS 2	8 9 15 6	2	8	24			Dark brown - dark brown gray, loose SAND and gravelly sand. Very fine - rarely medium grained sand. 20%+ non plastic fines. Gravel and shattered rock to 1/2"±. Spoon full of very dark brown - black water. No odor. Soil; 0 ppm. Water; 1 ppm.
482.21	14.5						4 1/4" HSA	8"/FB	Probable coarse gravel to 12.5'±. Probable sand with occasional gravel to 14.5'.
480.21	16.5	SS 3	2 2 3 8	2	16	24			Medium gray brown, loose, silty SAND. Very fine - predominately fine grained predominately quartz sand. 20%± non plastic fines. Abundant faint - prominent, light - medium orange, discontinuous mottles. Occasional medium - dark brown layers and lenses. Saturated. No odor or staining. 0 ppm.
									No refusal to depth. Set 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC at 14'6". Sand backfill to 3'4". Hole took an abnormally large amount of sand at 6'±. Bentonite seal 2'4" - 3'4". Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger
FB = Finger Bit
ppm: Refers to HNU reading (10.2 eV probe)
Depth to water from top of PVC

Johnson & Dix
White River Junction Bulk Facility

Hartford, Vermont

DATE: 12/27/90 PROJECT: 160017

LOG OF BORING: MW 7

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 8 INCLINATION V BEARING DATE START/FINISH 7/16/91 / 7/16/91

CASING ID CORE SIZE TOTAL DEPTH 23.17 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (MSL) DEPTH TO WATER/DATE 16± FT/ IMMED. LOGGED BY: B. COX

ELEV MSL FT	SAMPLE DEPTH FT	TYPE AND NO.	B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	4.33						4 1/4" HSA	8"/CCH	Miscellaneous sand, gravel, and till FILL. Occasional cobbles and boulders. Dry. No odor or staining. 0 ppm.
	6.33	SS 1	2 1 2 2	2	9	24			Medium - dark gray brown, very loose, till FILL over coal and cinders. Very fine - medium grained moderately well sorted sand. 20%± non plastic fines. 20%± fine rounded gravel. Moist. No odor or staining. 0 ppm.
	9.33						4 1/4" HSA	8"/CCH	
	11.33	SS 2	2 2 2 2	2	15	24			Medium brown, very loose - loose, sandy SILT. Very fine grained, well sorted sand. 60%± non plastic fines. Trace of fine roots at bottom. Damp. No odor or staining. 0 ppm.
	14.33						4 1/4" HSA	8"/CCH	SILT as above. Strange, faint, chemical like (?) odor below 12'±. 0 ppm. Sample obtained.
	16.33	SS 3	9 17 8 6	2	15	24			14'4" - 14'10" Medium brown, sandy, SILT as above 14'10" - 16'2" Medium brown, medium dense, gravelly SAND. Very fine - medium grained, poorly sorted sand (coarser bottom 3"). 10%+ fine, rounded gravel. Cobble at 15'±. Trace non plastic fines. Occasional light - medium rust colored mottles. Damp. No odor or staining. 0 ppm. 16'2" - 16'4" Medium gray SILT. Very fine grained sand. 60%+ non - slightly plastic fines. Saturated. No odor or staining. 0 ppm.
	19.33						4 1/4" HSA	8"/CCH	Probable SILT as above.
	21.33	SS 4	5 7 7 10	2	15	24			Medium gray, stiff - very stiff, clayey SILT. 80%+ slightly plastic fines. Slightly sticky. Saturated. No odor or staining. 0 ppm.
	23.17						4 1/4" HSA	8"/CCH	Probable SILT as above.
									No refusal to depth. Set 15' of 2", .010" slot, threaded, flush joint SCHD 40 PVC at 23'2". Sand backfill to 6'2". Bentonite seal 3'6" - 4'6". Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger.
CCH = Conical Cutter Head.
ppm: Refers to HNU reading (10.2 eV probe).
Depth to water from top of PVC.
Hit and broke two strands of wire at 3"+.

Johnson & Dix
White River Junction Bulk Facility
Hartford, Vermont
DATE: 7/16/91 PROJECT: 160017

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 9 INCLINATION V BEARING DATE START/FINISH 7/16/91 / 7/16/91

CASING ID CORE SIZE TOTAL DEPTH 23.50 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (MSL) DEPTH TO WATER/DATE 18± FT/ IMMED. LOGGED BY: B. COX

ELEV MSL FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	4.33						4 1/4" HSA	8"/CCH	0" - 4"± Bituminous concrete pavement. 4" - 4'4" Miscellaneous sand and gravel FILL. Bricks at 3'±. Slight fuel oil odor just under pavement. 2 ppm.
	6.33	SS 1	2 3 2 2	2	12	24			Miscellaneous FILL. Brick fragments at top overlying coal and cinders. Wet till at bottom (otherwise dry). No odor or staining. 0 ppm.
	9.33						4 1/4" HSA	8"/CCH	Probable FILL to 8'±, then silty SAND.
	11.33	SS 2	2 3 2 3	2	18	24			Medium - dark gray, loose, sandy SILT. Very fine grained, well sorted sand. 70%± non plastic fines Occasional very thin layers and very small lenses of light - medium gray, very fine - fine grained sand. Occasional small lenses of very dark gray silt. Damp. No odor or staining. 0 ppm.
	14.33						4 1/4" HSA	8"/CCH	Probable sandy SILT as above.
	16.33	SS 3	2 3 3 3	2	16	24			Medium gray, loose, sandy SILT. Very fine grained well sorted sand. 50%± non plastic fines. Damp. Very slight fuel oil odor. Trace ppm.
	19.33						4 1/4" HSA	8"/CCH	Water at 18'±.
	21.33	SS 4	8 11 58 18	2	15	24			Medium gray brown, medium dense - dense, gravelly SAND. Fine - occasionally coarse grained, poorly sorted sand. 20% - 30% rounded gravel 1/4" - 2" (with occasional cobbles). 10% - 20% non plastic fines. Saturated. No odor or staining. 0 ppm.
	23.50						4 1/4" HSA	8"/CCH	
									No refusal to depth. Set 15' Of 2", .010" slot, threaded, flush joint SCHD 40 PVC at 23'6". Sand backfill to 5'9". Bentonite seal 2'10" - 4'2". Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger.
CCH = Conical Cutter Head.
ppm: Refers to HNU reading (10.2 eV probe).
Depth to water from top of PVC.

Johnson & Dix
White River Junction Bulk Facility
Hartford, Vermont
DATE: 7/16/91 PROJECT: 160017

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 10 INCLINATION V BEARING DATE START/FINISH 7/16/91 / 7/16/91

CASING ID CORE SIZE TOTAL DEPTH 23.50 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (MSL) DEPTH TO WATER/DATE 18± FT/ IMMED. LOGGED BY: B. COX

ELEV MSL FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	4.33						4 1/4" HSA	8"/CCH	0" - 4"± Bituminous concrete pavement. 4" - 9"± GRAVEL. 9" - 4'4" Black SAND with gravel, cobbles, and occasional pieces of wood and metal. Faint fuel oil odor; Trace ppm at top, up to 6 ppm at bottom.
	6.33	SS 1	3 2 3 2	2	11	24			Medium - dark brown, silty, sandy, miscellaneous FILL. Occasional coal cinders. Abundant organic soil. Till-like bottom 2". Moist. Slight fuel oil odor. 3 ppm.
	9.33						4 1/4" HSA	8"/CCH	Up to 12 ppm.
	11.33	SS 2	3 2 1 2	2	15	24			Medium gray, very loose - loose, sandy SILT. Very fine grained, well sorted sand. 60% - 70% non plastic fines. Occasional very thin layers and lenses of light - medium gray, very fine - occasionally fine grained sand. Micaceous. Damp. Moderately strong fuel oil odor. 30 - 40 ppm
	14.33						4 1/4" HSA	8"/CCH	40 - 50 ppm.
	16.33	SS 3	10 10 11 9	2	10	24			Medium gray, medium dense, silty SAND. Very fine - occasionally fine grained, well sorted sand. 50%± non plastic fines. Trace mafic minerals, mica. Moist. Strong fuel oil odor. 60 - 80 ppm.
	19.33						4 1/4" HSA	8"/CCH	
	21.33	SS 4	9 7 10 8	2	18	24			19'4" - 20'4"± Medium - dark gray, stiff - very stiff, sandy SILT. 70%± non - slightly plastic fines. Saturated. 12 - 15 ppm. 20'4" - 21'4" Medium gray, sandy SILT. 70%± non plastic fines. Saturated. 3 ppm.
	23.50						4 1/4" HSA	8"/CCH	
									No refusal to depth. Set 15' of 2", .010" slot, threaded, flush joint SCHD 40 PVC at 23'2". Sand backfill to 6'6". Bentonite seal 4'6" - 5'8". Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger.
CCH = Conical Cutter Head.
ppm: Refers to HNU reading (10.2 eV probe).
Depth to water from top of PVC.

Johnson & Dix
White River Junction Bulk Facility

Hartford, Vermont

DATE: 7/16/91 PROJECT: 160017

LOG OF BORING: MW 10

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW 11 INCLINATION V BEARING DATE START/FINISH 7/17/91 / 7/17/91

CASING ID CORE SIZE TOTAL DEPTH 21.50 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (MSL) DEPTH TO WATER/DATE 15± FT/ IMMED. LOGGED BY: B. COX

ELEV MSL FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	4.50						4 1/4" HSA	8"/CCH	0" - 3"± Bituminous concrete pavement. 3" - 2'6"± Black gravelly SAND. No odor or staining. 0 ppm. 2'6" - 4'6" Brown gravelly SAND. No odor or staining. 0 ppm.
	6.50	SS 1	4 4 6 4	2	9	24			Medium brown, loose, gravelly SAND. Very fine - medium grained, poorly sorted sand. 10% - 20% non plastic fines. 20%± fine rounded gravel to 1". Dry. No odor or staining. 0 ppm.
	9.50						4 1/4" HSA	8"/CCH	Becomes silty below 8'±.
	11.50	SS 2	2 3 2 3	2	18	24			Medium - dark gray, very loose - loose, sandy SILT Very fine grained, well sorted sand. 60% - 70% non plastic fines. Occasional small layers and lenses of light - medium gray, very fine - fine grained sand. Organic odor. Moist - damp. 0 ppm
	14.50						4 1/4" HSA	8"/CCH	Probable sandy SILT as above.
	16.50	SS 3	2 1 1 2	2	16	24			Medium - dark gray, very loose, sandy SILT similar to above. 60%± non plastic fines. Organic odor. Trace wood fragments and roots. Abundant dark brown, thin root fillings. Saturated. 0 ppm.
	19.50						4 1/4" HSA	8"/CCH	
	21.50	SS 4	3 6 4 9	2	14	24			19'6" - 21'± Medium - dark gray, very loose - loose SAND. Fine - coarse grained (predominately medium - coarse grained), poorly sorted sand of quartz and rock fragments. 10%+ non plastic fines. 10%+ fine rounded gravel to 1/2". Trace mica and mafic minerals. Saturated. No odor or staining. 0 ppm. 21' - 21'6" Medium - dark gray, silty SAND. Very fine - fine grained sand. 20% - 30% non plastic fines. Occasional very thin layers magnetite(?) bottom 1/2". No odor or staining. 0 ppm
									No refusal to depth. Set 10' of 2", .010" slot, threaded, flush joint SCHD 40 PVC at 21'6". Sand backfill to 6'6". Bentonite seal 3'3" - 4'3". Grouted in flush Buffalo box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger.
CCH = Conical Cutter Head.
ppm: Refers to HNU reading (10.2 eV probe).
Depth to water from top of PVC.

Johnson & Dix
White River Junction Bulk Facility
Hartford, Vermont
DATE: 7/17/91 PROJECT: 160017

DH DUFRESNE-HENRY, INC.

BORING LOCATION RW 1 INCLINATION V BEARING DATE START/FINISH 7/17/91 / 7/17/91

CASING ID CORE SIZE TOTAL DEPTH 26.33 FT DRILLED BY: KENNEDY DRILLING (K.K.)

GROUND EL (MSL) DEPTH TO WATER/DATE 18± FT/ IMMED. LOGGED BY: B. COX

ELEV MSL FT	SAMPLE DEPTH FT	SAMPLE TYPE AND NO.	SAMPLE B	SAMP OD IN	LENGTH REC IN	LENGTH PENETRATION IN	REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	4.33						4 1/4" HSA	8"/CCH	0" - 3"± Bituminous concrete pavement. 3" - 4'4" Black gravelly SAND and miscellaneous fill. Occasional pieces of ceramic and brick. Slight fuel oil odor below pavement. 3 ppm.
	6.33	SS 1	5 5 3 2	2	20	24			4'4" - 4'7" Dark brown sandy FILL with some cinders. 4'7" - 6'4" Medium gray, very loose - loose, sandy SILT. Very fine grained, well sorted sand. 60%± non plastic fines. Occasional lenses and layers of light - medium gray, very fine grained sand. Slightly moist. Slight fuel oil odor. 3 - 5 ppm.
	9.33						4 1/4" HSA	8"/CCH	20 - 30 ppm.
	11.33	SS 2	2 2 2 2	2	18	24			Medium gray, very loose - loose sandy SILT similar to above. 70%± non plastic fines. Moist. Moderately strong fuel oil odor. 15 - 20 ppm.
	14.33						4 1/4" HSA	8"/CCH	30 - 40 ppm.
	16.33	SS 3	2 2 2 2	2	18	24			Alternating layers of light - medium gray, silty SAND and medium gray sandy SILT. Silty sand has very fine - fine grained, well sorted sand with 30%± non plastic fines. Sandy silt has very fine grained sand with 60%+ non plastic fines. Moist. Moderately strong - strong fuel oil odor. 40 - 50 ppm.
	19.33						4 1/4" HSA	8"/CCH	80 - 100 ppm.
	21.33	SS 4	12 19 15 9	2	10	24			19'4" - 20'10"± Brown SAND and GRAVEL. Saturated 80 - 100 ppm. 20'10" - 21'4" Medium gray, medium stiff - stiff, clayey SILT. Slightly plastic fines. Slightly sticky. Saturated. Slight fuel oil odor (markedly less than above). 10 ppm±.
	24.33						4 1/4" HSA	8"/CCH	
	26.33	SS 5	3 5 6 6	2	22	24			Medium gray, medium stiff - stiff, clayey SILT similar to above. Saturated. No odor or staining 0 ppm.
									No refusal to depth. Set 15' of 4", .020" slot, threaded, flush joint SCHD 40 PVC at 24'2". Sand backfill to 6'. Bentonite seal 5' - 6'. Grouted in flush 10" monitoring well box.

B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.
REC - Length of sample recovered.
SS - Split spoon sample.
U - Undisturbed samples
S - Shelby tube N - Denison
F - Fixed piston P - Pitcher
O - Osterberg
SAMP OD - Outside diameter of sampling spoon

NOTES

HSA = Hollow Stem Auger.
CCH = Conical Cutter Head.
ppm: Refers to HNU reading (10.2 eV probe).
Depth to water from top of PVC.

Johnson & Dix
White River Junction Bulk Facility

Hartford, Vermont

DATE: 7/17/91 PROJECT: 160017

PAGE 1 OF 1 LOG OF BORING: RW 1

DH DUFRESNE-HENRY, INC.

Johnson & Dix
White River Junction Bulk Facility
Hartford, Vermont

12/26/90

Dufresne-Henry, Inc. - Bruce Cox on site at 8:18 AM.
Kennedy Drilling - Kevin Kennedy already there.
Ed Kerrigan not on site. I spoke with Roger concerning the location of underground utilities, piping, etc. He said he had no knowledge of the locations. I spoke with Bruce in the J&D office. He called Neil Martin. I was told not to start until Neil Martin called back and gave permission to proceed. No one had seen Dig Safe, nor were there any marks on the ground.
Phone company on site at 8:45 AM±. They have no lines in the area of expected work.
Permission from Johnson & Dix to start MW 3 at 9:12 AM.

MW 3

Started boring at 9:12 AM. Drilled with hollow stem augers taking split spoon soil samples at 5 foot intervals. All water for washing tools was obtained from the J&D garage. All samples were screened with an HNU PI-101 (10.2 eV probe). Contaminated soils were encountered from under the pavement to the total depth of the boring. A preliminary identification of the contamination as fuel oil was made by odor. HNU readings of up to 160 ppm were obtained from the samples. Total depth of the boring was 21'6". Water was encountered at about 13'. Well set at 19'6". All pipe came from factory sealed plastic bags. Top of sand backfill at 7'. Bentonite seal at 4'6" - 6'. Grouted in flush Buffalo box.

Materials: 10' of 2", .010" slot, threaded, flush joint, Schd 40 PVC.
9'4" of 2", solid wall, threaded, flush joint, Schd 40 PVC.
300 lb± of sand.
25 lb± of bentonite pellets.
25 lb± of cement.
1 PVC well point bottom plug.
1 gasketed top cap.
1 Buffalo box.

Notified Bruce of findings in MW 3 at 10:40 AM. He provided plastic sheeting and located an area for on-site storage of the contaminated soil.

MW 4

Augers and tools were pressure cleaned on-site at the Johnson & Dix garage. Started boring at 11:48 AM. Drilled with hollow stem augers taking split spoon soil samples at 5 foot intervals. All water for washing tools was obtained from the J&D garage. All samples were screened with an HNU PI-101 (10.2 eV probe). No contamination (visual or odor) was observed in the samples or on the tools. HNU readings of less than 1 ppm were obtained. Total depth of the boring was 16'6". Water was encountered at about 11'. Well set at 14'6". All pipe came from factory sealed plastic bags. Top of sand backfill at 3'. Bentonite seal at 2'3" - 3'. Grouted in flush Buffalo box.

Materials: 10' of 2", .010" slot, threaded, flush joint, Schd 40 PVC.
4'4" of 2", solid wall, threaded, flush joint, Schd 40 PVC.

280 lb± of sand.
20 lb± of bentonite pellets.
50 lb± of cement.
1 PVC well point bottom plug.
1 gasketed top cap.
1 Buffalo box.

MW 5

Started boring at 1:53 PM. Drilled with hollow stem augers taking split spoon soil samples at 5 foot intervals. All water for washing tools was obtained from the J&D garage. All samples were screened with an HNU PI-101 (10.2 eV probe). Contaminated soils were encountered from under the pavement to the total depth of the boring. A preliminary identification of the contamination as fuel oil (and possibly gasoline) was made by odor. HNU readings of up to 130 ppm were obtained from the samples. A Total Petroleum Hydrocarbons (TPH) soil sample was taken at 2:40 PM and placed in a cooler. Total depth of the boring was 21'6". Water was encountered at about 13'. Well set at 19'6". All pipe came from factory sealed plastic bags. Top of sand backfill at 5'10". Bentonite seal at 4'10" - 5'10". Grouted in flush Buffalo box. Contaminated soil disposed of on-site.

Materials: 10' of 2", .010" slot, threaded, flush joint, Schd 40 PVC.
9'4" of 2", solid wall, threaded, flush joint, Schd 40 PVC.
320 lb± of sand.
20 lb± of bentonite pellets.
50 lb± of cement.
1 PVC well point bottom plug.
1 gasketed top cap.
1 Buffalo box.

Pressure washed augers and tools on-site at the Johnson & Dix garage.
Left site at 4:57 PM.
Weather: Overcast, occasional flurries, teens - 20's.
Visitors: Various J&D employees.
Phone Co. at 8:45 AM±.
U. S. Sprint employee at 9:20 am. All their fiber optic lines are along the railroad.
T. Reeves (D-H): 2:30 PM± - 2:45 PM±. I brought Ted up to date on findings and contacts with Johnson & Dix.
Neil Martin: 3:30PM±. Went over findings to present and work anticipated for tomorrow.

12/27/90

BHC on site at 7:58 AM.
Kennedy Drilling (K.K.) already on site.
Spoke with Ed Kerrigan at 8:25 AM±. I told him about work and findings to the present and anticipated work for today. He asked that I stop by before leaving with a progress report.

MW 6

Started boring at 8:30 AM. Drilled with hollow stem augers taking split spoon soil samples at 5 foot intervals. All water for washing tools was obtained from the J&D garage. All samples were screened with an HNU PI-101 (10.2 eV probe). No contamination (visual or odor) was observed in the samples or on the tools. HNU readings of less than 1 ppm were obtained.

Total depth of the boring was 16'4". Water encountered at about 10'. Well set at 14'4". All pipe came from factory sealed plastic bags. Top of sand backfill at 2.5'±. Bentonite seal at 1.5' - 2.5'±. Grouted in flush Buffalo box.

Materials: 10' of 2", .010" slot, threaded, flush joint, Schd 40 PVC.
4'2" of 2", solid wall, threaded, flush joint, Schd 40 PVC.
275 lb± of sand.
20 lb± of bentonite pellets.
50 lb± of cement.
1 PVC well point bottom plug.
1 gasketed top cap.
1 Buffalo box.

MW 7

Started boring at 10:30 AM. Drilled with hollow stem augers taking split spoon soil samples at 5 foot intervals. All water for washing tools was obtained from the J&D garage. All samples were screened with an HNU PI-101 (10.2 eV probe). No contamination (visual or odor) was observed in the samples or on the tools. HNU readings of less than 1 ppm were obtained. Total depth of the boring was 16'6". Water was encountered at about 10'. Well set at 14'6". All pipe came from factory sealed plastic bags. Top of sand backfill at 3'4". Hole took an abnormal amount of sand at 6'±. Bentonite seal at 2'4" - 3'4". Grouted in flush Buffalo box.

Materials: 10' of 2", .010" slot, threaded, flush joint, Schd 40 PVC.
4'4" of 2", solid wall, threaded, flush joint, Schd 40 PVC.
550 lb± of sand.
25 - 30 lb of bentonite pellets.
50 lb± of cement.
1 PVC well point bottom plug.
1 gasketed top cap.
1 Buffalo box.

Left at 1:42 PM.
Note: Ed Kerrigan not on site at the time of my departure. I left a card with the receptionist and requested that he call if he had any questions.
Weather: Partly sunny, singles - teens AM, teens PM.
Visitors: Various J&D employees.
TPH sample sent to Eastern Analytical, Inc.

Johnson & Dix
White River Junction Bulk Facility
Hartford, Vermont
Phase II Monitoring Wells

7/16/91

Checked calibration of HNU at 7:00 am±. OK.
Dufresne-Henry (Bruce Cox) on site at 7:55 am.
Kennedy Drilling (Kevin Kennedy) already there.
Checked in with Ed Kerrigan, but he was on the phone.
K. Kennedy had sounded most of the previously installed wells prior to my arrival. Most were dry or had very little water in them. The White River was very low. As a result, I changed the proposed monitoring well installation from that in the work plan. Will auger 5 feet into the water table and set a well with 15 feet of screen.

MW 8

Started boring at 8:27 am. The rig and tools had been steam cleaned prior to arrival on-site. All water for cleaning spoons and other tools was obtained on-site at the J&D garage. During drilling, air quality in the breathing space was periodically monitored with an HNU PI-101 (10.2 eV probe) and a Gastech CGI/O2/H2S meter (monitoring log attached). Drilled with 4 1/4" hollow stem augers taking split spoon soil samples at 5 foot intervals. All soil samples were screened for VOC's with the HNU. Representative soil samples (not for chemical analysis) from each split spoon were stored in clear glass jars and retained by Dufresne-Henry. Below 11' soil with a faint strange odor was noted coming from the auger flights. Two samples for possible chemical analysis were collected in clear glass jars and put in a cooler. No other contamination (visual or odor) was observed in the samples or on the tools. No HNU readings were observed. Total depth of the boring was 23'4" with no refusal. The general geologic section consists of miscellaneous fill to a depth of more than 6 feet, then sandy silt to the depth of the boring. Installed a 2", .010" slot, threaded, flush joint, SCHD 40 PVC well at 23'2". All pipe came from factory sealed plastic bags. The annular space was backfilled with silica sand to 6'2". Bentonite pellet seal installed from 3'6" - 4'6". Grouted in flush Buffalo box. All excess soil was stored on-site at the previously established stockpile. Finished at 10:55 am±.

Note: two strands of black insulated copper wire were augered up at 2"±. The wires appeared to be dead. Upon completion of the well the excess was snipped off and the ends taped. The taped ends will be found just northeasterly of the Buffalo box.

Materials: 15' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC.
8' of 2", solid wall, threaded, flush joint, SCHD 40 PVC.
475 lb± of silica sand.
35 lb± of bentonite pellets.
50 lb± of cement mix.
2 gasketed caps.
1 Buffalo box

MW 9

The augers and tools were steam cleaned on-site at the northwest corner of the office/garage from 11:00 am - 11:25 am. All water for steam cleaning

and washing split spoons and other tools was obtained on-site at the J&D garage. Started boring at 11:36 am. During drilling, air quality in the breathing space was periodically monitored with an HNU PI-101 (10.2 eV probe) and a Gastech CGI/O2/H2S meter (monitoring log attached). Drilled with 4 1/4" hollow stem augers taking split spoon soil samples at 5 foot intervals. All soil samples were screened for VOC's with the HNU. Representative soil samples (not for chemical analysis) from each split spoon were stored in clear glass jars and retained by Dufresne-Henry. Contaminated soil was encountered from just under the pavement to about 3 feet. A slight fuel oil odor was noted with HNU readings of 2 ppm. Total depth of the boring was 23'6" with no refusal. The general geologic section consists of miscellaneous fill to a depth of about 6 feet, sandy silt to 18 feet±, and gravelly sand to the bottom of the boring. Installed a 2", .010" slot, threaded, flush joint, SCHD 40 PVC well at 23'2". All pipe came from factory sealed plastic bags. The annular space was backfilled with silica sand to 5'9". Bentonite pellet seal placed from 2'10" - 4'2". Grouted in flush Buffalo box. Excess soil was stored on-site at the previously established stockpile. Finished at 2:05 pm±.

Materials: 15' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC.
8' of 2", solid wall, threaded, flush joint, SCHD 40 PVC.
450 lb± of silica sand.
35 lb± of bentonite pellets.
50 lb± of cement mix.
2 gasketed caps.
1 Buffalo box.

MW 10

The augers and tools were steam cleaned on-site at the northwest corner of the office/garage from 2:15 pm - 2:30 pm. All water for steam cleaning and washing split spoons and other tools was obtained on-site at the J&D garage. Started boring at 2:35 pm. During drilling, air quality in the breathing space was periodically monitored with an HNU PI-101 (10.2 eV probe) and a Gastech CGI/O2/H2S meter (monitoring log attached). Drilled with 4 1/4" hollow stem augers taking split spoon soil samples at 5 foot intervals. All soil samples were screened for VOC's with the HNU. Representative soil samples (not for chemical analysis) from each split spoon were stored in clear glass jars and retained by Dufresne-Henry. Contaminated soils were encountered from just under the pavement to the total depth of the boring, but the degree decreased markedly in the bottom 1 - 2 feet. HNU readings ranged from about 6 ppm under the pavement to 60 - 80 ppm just above the water table. Readings decreased to about 3 ppm in the silt below the water table surface. The product appeared to fuel oil. Total depth of the boring was 23'6" with no refusal. The general geologic section consists of miscellaneous fill to about 6 feet and sandy silt to the depth of the boring. Installed a 2", .010" slot, threaded, flush joint, SCHD 40 PVC well at 23'2". All pipe came from factory sealed plastic bags. The annular space was backfilled with silica sand to 6'6". Bentonite pellet seal placed from 4'6" - 5'8". Grouted in flush Buffalo box. Excess soil was stored on-site at the previously established stockpile. Finished at 4:50 pm±.

Materials: 15' of 2", .010", threaded, flush joint, SCHD 40 PVC.
8' of 2", solid wall, threaded, flush joint, SCHD 40 PVC.
450 lb± of silica sand.
30 lb± of bentonite pellets.
60 lb± of cement mix.
2 gasketed caps.
1 Buffalo box.

Left site at 5:02 pm.
Weather: sunny, low 80's am - high 80's pm, breezy.
Visitors: Ed Kerrigan and various other J&D employees.

7/17/91

Dufresne-Henry (Bruce Cox) on site at 8:15 am. Got ties from the Hartford town office to locate sewerlines in the vicinity of the pump station. Kennedy Drilling (Kevin Kennedy) already on site and steam cleaning equipment.

MW 11

Steam cleaned augers and tools on-site at the northwest corner of the office/garage. All water for steam cleaning and washing split spoons and other tools was obtained on-site at the J&D garage. Started boring at 8:50 am. During drilling, air quality in the breathing space was monitored with an HNU PI-101 (10.2 ev probe) and a Gastech CGI/O2/H2S meter (monitoring log attached). Drilled with 4 1/4" hollow stem augers taking split spoon soil samples at 5 foot intervals. All samples were screened for VOC's with the HNU. Representative soil samples (not for chemical analysis) from each split spoon were stored in clear glass jars and retained by Dufresne-Henry. No contamination (visual or odor) was observed in the samples or on the tools. No HNU readings were observed. Total depth of the boring was 21'6" with no refusal. The general geologic section consists of gravelly sand to a depth of about 8 feet, sandy silt with abundant wood and other organic matter to at least 16'6", and silty sand to the depth of the boring. Installed a 2", .010" slot, threaded, flush joint, SCHD 40 PVC well at 20'0". All pipe came from factory sealed plastic bags. The annular space was backfilled with silica sand to 6'6". Bentonite pellet seal placed from 3'3" - 4'3". Grouted in flush Buffalo box. Excess soil was stored on-site at the previously established stockpile. Finished at 10:35 am±.

Materials: 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC.
10' of 2", solid wall, threaded, flush joint, SCHD 40 PVC.
350 lb± of silica sand.
35 lb± of bentonite pellets.
40 lb± of cement mix.
1 PVC bottom point.
1 gasketed cap.
1 Buffalo box.

RW 1

The augers and tools were steam cleaned on-site at the northwest corner of the office/garage from 10:45 am - 11:00 am. All water for steam cleaning and washing spoons and other tools was obtained on-site at the J&D garage. Started boring at 11:07 am. During drilling, air quality was periodically monitored with an HNU PI-101 (10.2 eV probe) and a Gastech CGI/O2/H2S meter (monitoring log attached). Drilled with 6 1/4" hollow stem augers taking split spoon soil samples at 5 foot intervals. All soil samples were screened for VOC's with the HNU. Representative soil samples (not for chemical analysis) from each split spoon were stored in clear glass jars and retained by Dufresne-Henry. Several samples for soils lab analysis were also obtained and placed in zip-lock plastic bags. Contaminated soils were encountered from just under the pavement to about 21 feet. HNU readings ranged from about 3 ppm under the pavement to 80 - 100 ppm just above the

water table. The product appeared to be fuel oil. Odor and HNU readings decreased markedly below the water table surface. Total depth of the boring was 26'4" with no refusal. The general geologic section consists of miscellaneous fill to about 4'6" and sandy silt or clayey silt to the depth of the boring. Installed a 4", .020" slot, threaded, flush joint, SCHD 40 PVC well at 24'2". All pipe came from factory sealed plastic bags. The annular space was backfilled with silica sand to 6 feet. Bentonite pellet seal placed from 5' - 6'. Grouted in flush 10" monitoring well box. Excess soil was stored on-sit at the previously established stockpile. Finished at 2:45 pm. The well recovered about 1 foot in an hour. As a result no development was done. The formation is very silty and the yield of the well is probably going to be limited.

Materials: 15' of 4", .020" slot, threaded, flush joint, SCHD 40 PVC.
10' of 4", solid wall, threaded, flush joint, SCHD 40 PVC.
850 lb± of silica sand.
50 lb± of bentonite pellets.
40 lb± of cement mix.
1 PVC bottom point.
1 gasketed cap.
1 10" monitoring well box.

Spoke with Ed Kerrigan prior to leaving and gave him a status report of findings and anticipated sampling schedule.
Left site at 4:17 pm.
Weather: sunny, low 80's am - high 80's+ pm, breezy.
Visitors: Ed Kerrigan and various other J&D employees.

Note: The stage of the White River is very low. The elevation of the river at the site is controlled by backwater from the Connecticut River. The elevation changes daily due to operations at Wilder Dam (presumably for power production during peak demand). On the afternoon of 7/17 the White River was an estimated 2' - 3' higher than during the morning. The rate of rise was not observed. The aquifer at the site almost certainly cannot react with the speed the river rises and falls.

Johnson & Dix
White River Junction Bulk Facility
Air Quality Monitoring Log

MW 8 (7/16/91)

TIME	HNU (ppm)	LEL (%)	O2 (%)	H2S (ppm)
8:30 am	0	1	20.7	0
9:00	0	0	20.6	0
9:27	0	1	20.3	0
9:52	0	1	20.4	0

MW 9 (7/16/91)

TIME	HNU (ppm)	LEL (%)	O2 (%)	H2S (ppm)
11:39 am	0	0	20.8	0
12:05 pm	0	1	21.1	.1
12:50	0	1	21.3	.1
1:34	0	1	21.2	.1 - .2

MW 10 (7/16/91)

TIME	HNU (ppm)	LEL (%)	O2 (%)	H2S (ppm)
2:45 pm	0	1	21.0	.1
3:01	0	1	21.1	0
3:13	2	1	21.2	0
3:30	2 *	1	21.3	0
3:56	3 - 5	1	21.3	0

* 12 - 15 ppm for several seconds when auguring

MW 11 (7/17/91)

TIME	HNU (ppm)	LEL (%)	O2 (%)	H2S (ppm)
9:00 am	0	0	21.3	0
9:15	0	0 - 1	21.0	0
9:35	0	0	20.8	0
9:47	0	1	21.1	0

RW 1 (7/17/91)

TIME	HNU (ppm)	LEL (%)	O2 (%)	H2S (ppm)
11:15 am	0	0	20.6	0
11:35	0	1	21.0	0
11:45	0	1	21.1	0
12:00	0 - 1 **	1	21.0	0
1:15 pm	0 - 1 **	1	21.0	0

** 10 - 15 ppm for several seconds during auguring

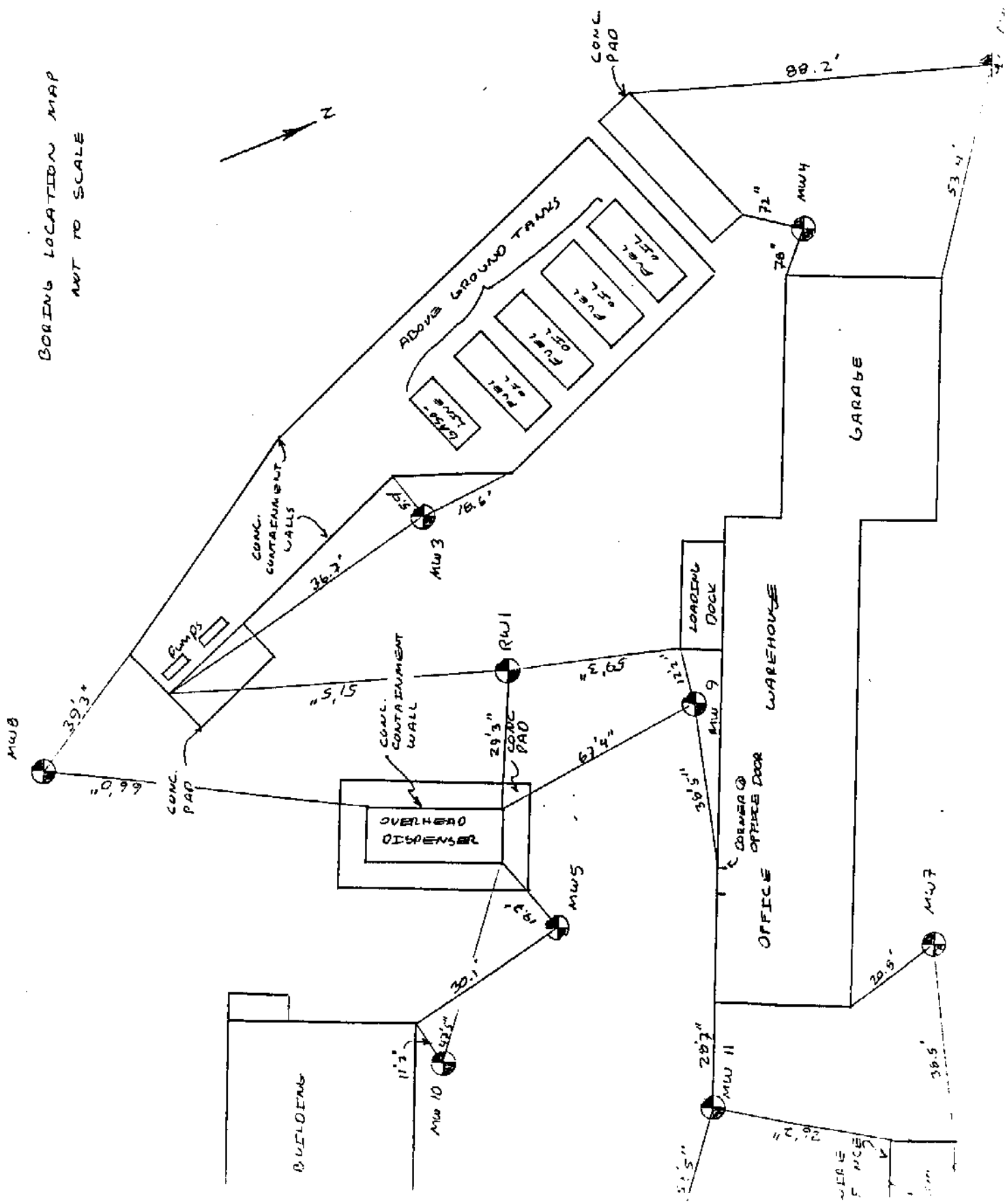
DUFRESNE-HENRY, INC.

PREPARED BY B. COX DATE 12/28/90 PROJECT NO. 160012

CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. _____ OF _____

ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

SUBJECT JOHNSON & OY WHITE RIVER JCT. BULK FACILITY



APPENDIX C

WORK PLAN

Proposed Work Plan
Installation of Monitoring and Recovery Wells

JOHNSON & DIX FUEL CORP WHITE RIVER JUNCTION BULK FACILITY

The additional borings proposed under this phase of the project will serve a dual purpose; further defining the extent of the contamination plume and will serve as an integral part of the site remediation program. The number and location of borings have been chosen with these purposes in mind. The installation of five wells is anticipated. Four of the wells will be used for groundwater quality monitoring, with the fifth well to be used for product recovery. All borings and monitoring well installations will be performed by Kennedy Drilling of Troy, New Hampshire under the field supervision of Dufresne-Henry personnel. All personnel on the site are OSHA certified for hazardous site operations under 29 CFR part 1910.120.

BORINGS

It is anticipated that the borings for the monitoring wells will be done using 4 1/4" hollow stem augers. The recovery well will be installed using 6 1/4" hollow stem augers. Hollow stem augers offer the advantages of minimal hole caving, ease of geologic sampling, and relatively easy monitoring well installation. They generally are the most cost effective method given the sites subsurface conditions. Monitoring well borings will be taken to a depth of 5' into the prevailing groundwater table or to refusal, whichever occurs first. The boring for the recovery well will be 10 feet into the prevailing water table. Petroleum based pipe dope for use on drill rods, tools, or casing will not be allowed. No type of drilling mud, including polymers, will be used. Should flowing sands be encountered, clean water obtained on-site will be used to increase hydraulic head. If the flowing sands are particularly problematic, casing will be used.

SOIL SAMPLING

Soil samples will typically be taken at 5 foot intervals using a split spoon sampler. Sampling at other intervals may occur and will be a field decision of the Dufresne-Henry inspector. Possible reasons include abrupt changes in drill rate and suspected, or known, zones of contamination. The split spoon sampler allows retrieval of relatively undisturbed soil samples from a known depth for classification and Volatile Organic Compound (VOC) screening. All soil samples and material from the auger flights will be screened for VOC's with an HNU PI-101 photoionization detector (10.2 eV lamp). The act of driving the sampler (Standard Penetration Test) also gives an indication of the density or degree of compaction of the soil. Representative samples from each spoon will be placed in glass jars and retained by Dufresne-Henry. These are for project records only and are not intended for chemical analysis. Detailed logs of geology, drilling data, and HNU readings will be prepared for each boring. Soil samples for laboratory analysis are not anticipated as part of this project. Water quality samples will not be obtained during the boring program.

MONITORING WELLS

Monitoring wells will be constructed from 2", 0.010" machine slot, threaded, flush joint, Schedule 40 PVC. Assuming no refusal, each monitoring well will consist of 10' of screen with sufficient riser to reach approximately 2" below the surface grade. The bottom of the well will be set such that approximately 5 feet of screen extends above and below the

water table observed at the time of installation. The bottom of all wells will be provided with a push-on PVC cap or a plug with an expanding gasket. The annular space between the auger and the screen will be carefully backfilled with clean silica sand to create a filter pack around the well. The filter pack will extend from the bottom of the well to approximately 2 feet above the screen. At that point a seal will be installed consisting of about 1 foot (dry) of bentonite pellets. The remainder of the hole will be backfilled with native soil to about 2 feet from the surface. Another bentonite seal will be installed and a cast iron water box (Buffalo box) will be grouted in flush at the surface. All wells will have removable top caps for sampling and sounding.

RECOVERY WELL

The recovery well will be constructed from 4", threaded, flush joint, Schedule 40 PVC. The screen slot size will be chosen based on the results of sieve analyses of soil samples from the first phase of the project and the filter sand to be used. The installation will be as previously described. A Buffalo box will not be used in favor of larger diameter protection for ease of access and the proposed plumbing and electrical connections for a remedial system.

To maximize the effectiveness of the recovery well, it is desirable to enhance the hydraulic connection between the well and the aquifer. Based on the diameter of the well, development will consist of surging and pumping (or bailing). A surge block will be lowered into the screened interval of the well and slowly raised and lowered approximately 3 feet at a time. This action pumps fines out of the filter pack and formation and into the well. The sediment will periodically be removed by pumping or bailing. The process will continue until all of the screened section has been developed. All fluids and solids removed from the well will be drummed and stored on-site.

DECONTAMINATION

The additional borings are expected to be completed within the zone of contamination. However, to prevent cross contamination between the borings, strict decontamination procedures will be followed. All in-ground tools and equipment will be decontaminated by steam cleaning prior to the start of work and between borings to prevent cross contamination. All decontamination will be done on-site at a designated location. Routine cleaning of equipment, such as washing split spoons, will use water obtained at the facility with disposal on-site. Decontamination of drilling equipment between borings will be done on-site by steam cleaning. The decontamination area will be designated prior to the start work. Excess contaminated soil will be stockpiled on-site at a location to be designated by Johnson & Dix. The soil will be placed on a sheet of 6 mil polyethylene and then covered with the same material.

WATER QUALITY SAMPLING TECHNIQUES
Quality Assurance Document

Introduction

Sample collection for groundwater monitoring wells is performed with polyvinyl chloride (PVC) bailers for samples which are analyzed for inorganic parameters and by Teflon bailers for organic parameters. Surface water samples are hand grab samples. All samples are collected in suitable containers and refrigerated and/or field preserved as appropriate until delivered to a certified laboratory for analysis. Samples are delivered to the laboratory as soon as possible and in all circumstances within the recommended delivery time for specific parameters. A Chain of Custody record is kept for each sample location and sampling occurrence.

Monitoring Wells

The casing and well guard are inspected for signs of vandalism or damage. The condition of the ground surface at the well head is examined for signs of surface water infiltration. Information regarding condition is noted as well as information regarding identification of the lock and key. Well casing diameter is noted. Weather conditions are noted as well as any recent rainfall or drought conditions.

Upgradient wells ("clean") are sampled prior to downgradient wells. Static water level is determined using an electronic water sounder or a tape and weight with an accuracy of ± 0.01 foot. Measurements are recorded to the nearest 0.02 foot from the top of the protective steel casing or monitoring well casing. The PVC bailer is washed with a non-ionic phosphate free detergent and rinsed with distilled water. The depth to the bottom of the well is determined and the volume of water required for purging is calculated. A minimum of three volumes of static water in the well is purged. The purged water is discarded. Teflon bailers are used for sample collection. The Teflon bailers are washed with detergent and rinsed with distilled water between sampling locations.

The color, odor, and turbidity of the sample is noted. Samples are obtained for parameters required for the specific well. An example of the parameters typically obtained immediately after the well has been flushed are: chemical oxygen demand (COD), chloride, and site specific metals. Samples may also be obtained for nitrates, calcium, manganese, sulfates, total organic compounds, total halogenated organic compounds, and volatile organic compounds. If volatile organic analysis (VOA) is required, these samples are obtained first. The VOA sample is slowly released into a clean VOA vial with as little disturbance to the sample as possible. The vial cap is retained in the hand during the process with the Teflon seal protected from all contamination. No free gases are permitted in the sample.

All samples which will be analyzed for metals and COD are field filtered using a pressurized 0.45u filter. Samples are placed in containers provided by the certified laboratory and labeled with an identification number, date, and method of preservation.

Surface Water Sampling

Hand grab samples are collected at surface water sampling locations.

Samples are obtained from mid-depth of the water column in a field cleaned sampling device. Samples which will be analyzed for metals, COD, and which have observable turbidity are filtered with a 0.045u filter and immediately preserved. Field parameters of temperature, pH, and specific conductance are also measured in the water column. Conditions in the vicinity of the sampling location are noted, depth of sample below water surface, and general flow conditions.

Sample Preservation and Handling

Samples collected which require fixing with preservative chemicals are placed in sample containers with the appropriate reagent. The samples are placed in insulated chests with ice packs or ice. Samples are kept refrigerated until they are delivered to the laboratory no later than allowable according to the holding times determined by Standard Methods. Sampling personnel contact the laboratory personnel regarding sampling delivery and analysis.

Record Keeping

Field data sheets are utilized to reconstruct sampling conditions at any time after sampling. These sheets shall contain all information regarding the site: name, date, time of sampling, weather, ambient air temperature, identification numbers, and sampler's name. Field data is to include information regarding the condition of the well head and casing, well specifics (total depth, static water level, diameter, length of casing above grade, volume of water purged), sampling date (equipment used, depth sample obtained, physical properties of sample), field measurements of pH, conductivity, temperature, and the number and type of sample containers.

Chain of custody record for all samples shall be maintained. A sample shall be considered to be in the custody of an individual if it is in the direct view of, or otherwise controlled by, the individual in custody. Storage of samples during custody shall be accomplished according to established preservation techniques in appropriately sealed and numbered storage containers. Chain of custody shall be maintained during the exchange of the samples or sealed sample container directly transferred from one individual to the next with the former custodian witnessing the signature of the recipient on the chain of custody record. Chain of custody forms shall contain the following information: sample location names, field identification numbers, signature of collector, date and time of collection, number of containers transferred, parameters for analysis, all signatures of individuals involved in the chain of possession, description of sample condition, and any comments regarding sample collection.

Quality Assurance and Control

To check the integrity of field sampling and equipment cleaning techniques, the following field control procedures are used. Field blanks, and occasionally trip blanks, are used as control or external QA/QC samples to detect contamination that may be introduced in the filed (atmospheric or from sampling equipment), in transit to or from the sampling site, during bottle preparation, and sample log-in or storage.

A "trip blank" follows all samples through the sampling period. The trip blank is prepared at the laboratory using organic-free water and is

kept with the sample containers and samples at all times. It is not opened and is analyzed with the other samples obtained. If this sample is accidentally opened, it is noted in the chain of custody records. The trip blank is commonly used for quality control on volatile organic analyses.

A "field blank" is collected after sampling a well that previously indicated high concentrations of the water quality parameters analyzed. The sampling equipment is cleansed and a sample of distilled water is obtained using the sampling equipment. The distilled water sample is then used to prepare the field blank.

A sample replicate is used periodically to provide quality assurance for the laboratory analysis techniques. A sample is split in the field and provided to the laboratory in two or more sampling containers.

Decontamination of Field Equipment

All filed equipment is rinsed with de-ionized or distilled water. This includes the electronic water sounder probe, the bailer winch spool, Teflon coated bailer wire, filter unit, and bailers. In addition, the bailers are disassembled, washed with a non-phosphate detergent, and rinsed with pressurized distilled water.

Site Health and Safety

All sampling personnel shall receive an annual medical examination to determine the baseline physiological condition. Appropriate blood chemistry work and x-rays are taken as required.

Protective clothing is worn by all site technicians during sampling. This clothing includes protective rubberized overalls, rubber gloves, and steel-toed boots. Full-face respirators with organic filter cartridges, combustible gas and oxygen detection meters, and photoionization detectors are available for the sampler's protection.

Upon arrival at the site a visual survey is performed to determine the safety of the work place. No water quality testing is performed if there is any evidence of hazardous waste disposal or the uncovering of suspected hazardous materials. Upon arrival at a monitoring well location, the cap is removed from an upwind position. The well head is allowed to vent for at least five minutes while sampling equipment is set up. No smoking or use of flammable materials is permitted adjacent to a well head.

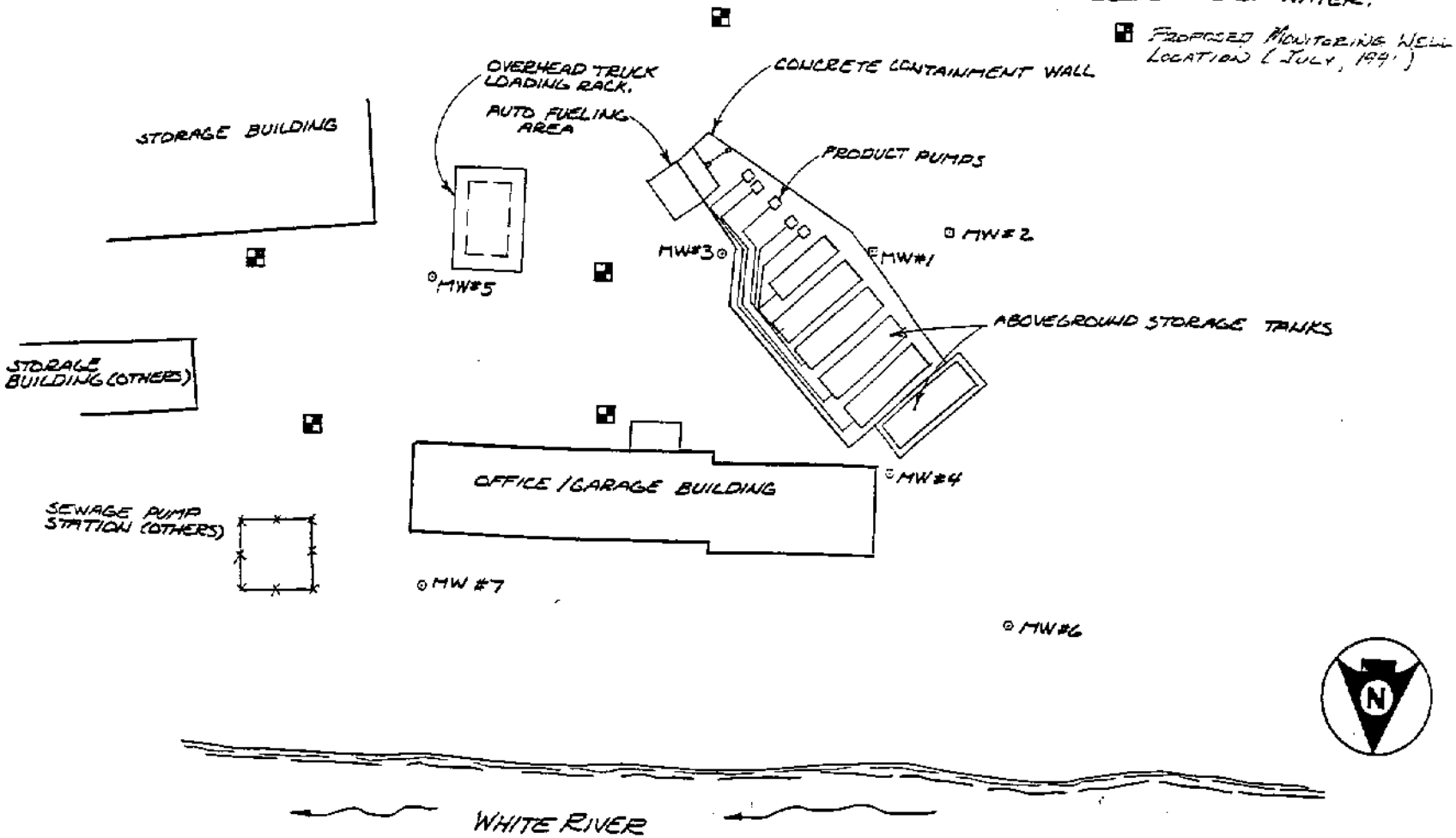
Data Transaction, Reduction and Report Generation

Data analysis and interpretation are the responsibility of the Project Manager or Project Team member responsible for a particular task of the project. The data are compiled in table form for ease of presentation to highlight the significant information. The data may be input into the computer and plotted on various types of graphs and maps, or analyzed by various statistical methods.

Sampling Protocol Addendum for: Johnson & Dix
White River Junction, Vermont
Bulk Facility

1. The person(s) sampling the wells will utilize an HNU photoionization detector. Immediately upon removal of the well cap, the HNU will be used to make a preliminary determination as to the VOC activity in the well.

2. A Teflon bailer will then be lowered into the well to check for the presence of free product floating on the groundwater surface. After ascertaining the presence of free product, the well will be sounded, purged, and sampled as outlined above.



SITE PLAN
SCALE: 1" = 40'-0"

Dufresne-Henry Inc.

JOHNSON & DIX FUEL CORP.

BRIDGE STREET BULK STORAGE FACILITY

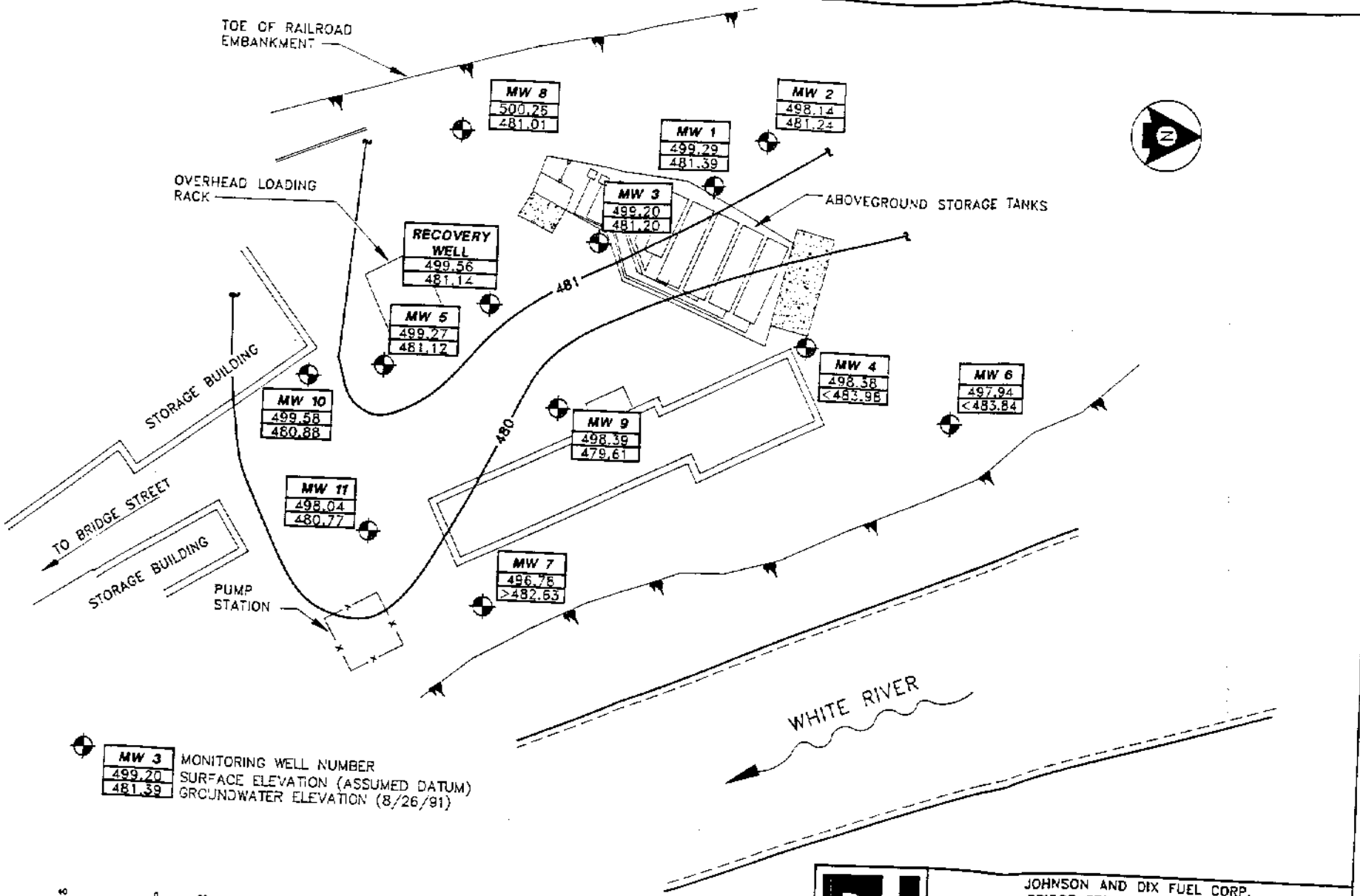
WHITE RIVER JCT., VERMON

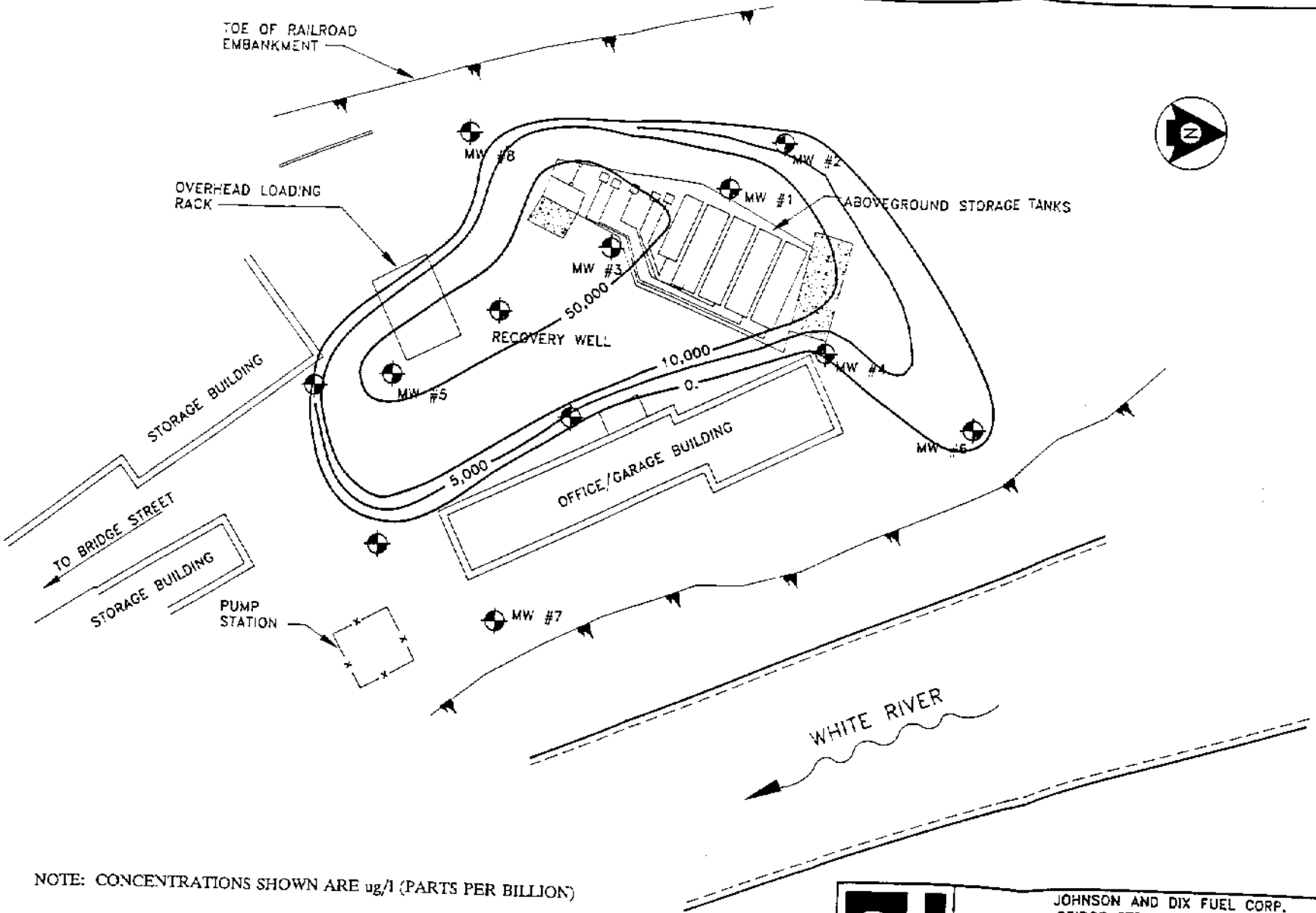
Client No. 160017 Proj Mgr

APPENDIX D

BTEX AND TVPH

ISOCONCENTRATION MAPS


TOE OF RAILROAD EMBANKMENT
MW 8
500.25
481.01
MW 2
498.14
481.24
MW 1
499.29
481.39
MW 3
499.20
481.20
OVERHEAD LOADING RACK
ABOVEGROUND STORAGE TANKS
RECOVERY WELL
499.56
481.14
MW 5
499.27
481.12
481
480
STORAGE BUILDING
MW 10
499.58
480.88
MW 4
498.38
<483.96
MW 6
497.94
<483.84
MW 9
498.39
479.61
MW 11
498.04
480.77
TO BRIDGE STREET
STORAGE BUILDING
PUMP STATION
MW 7
496.76
>482.63
WHITE RIVER
MW 3
499.20
481.39
MONITORING WELL NUMBER
SURFACE ELEVATION (ASSUMED DATUM)
GROUNDWATER ELEVATION (8/26/91)
40 0 20 40 80 160
1 inch = 40 ft
Dufresne-Henry Inc.
JOHNSON AND DIX FUEL CORP.
BRIDGE STREET BULK FACILITY
GROUNDWATER @ J&D BRIDGE ST.
AS OF 11/1/91
WHITE RIVER JUNCTION,
VERMONT



NOTE: CONCENTRATIONS SHOWN ARE ug/l (PARTS PER BILLION)

40 0 20 40 80 160

1 inch = 40 ft.

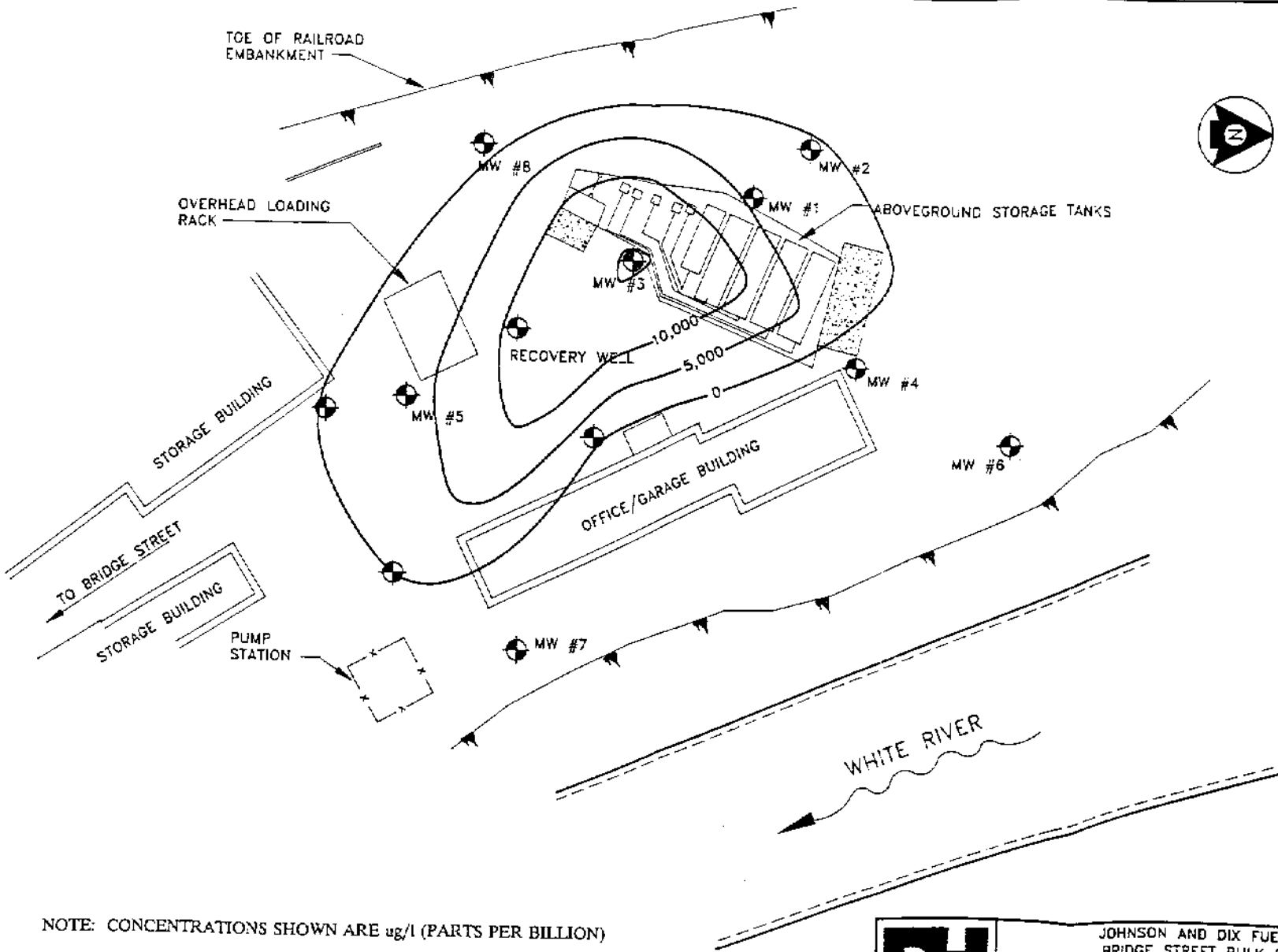
Duffesne-Henry Inc.

JOHNSON AND DIX FUEL CORP.
BRIDGE STREET BULK FACILITY

TVPH - SITE PLAN

WHITE RIVER JUNCTION, VERMONT

Client No. 160017 | Proj.Mgr. T.S.R. | Date 12/91 | E



NOTE: CONCENTRATIONS SHOWN ARE ug/l (PARTS PER BILLION)

1 inch = 40 ft

Dufresne-Henry Inc.

JOHNSON AND DIX FUEL CORP.
BRIDGE STREET BULK FACILITY

BTEX - SITE PLAN

WHITE RIVER JUNCTION, VERMONT

Client No. 160017 Project Mgr. T.S.R. Date 12/91

APPENDIX E

ANALYSIS RESULTS

Eastern Analytical, Inc. 130 Hall St., Concord, NH 03301 (603) 228-0525

September 19, 1991

Peter Aldrich
Dufresne-Henry
Precision Park
North Springfield, VT 05150

Sample Identification:
Client ID: 160017 Bridge St
Sample Qty/Type: 6 aqueous
Date Recv'd: August 15, 1991
EAI ID: 2382B DUF

Dear Mr. Aldrich:

Enclosed, please find the results of the analysis of the sample(s) identified above. This report contains the following sections:

ANALYSIS TYPE	NO. OF PAGES
• Hazardous Substance List (HSL) VOCs	1

The following standard abbreviations and conventions apply throughout all Eastern Analytical, Inc. reports:

- < = "Less than" followed by the detection limit
- TNR = Testing Not Requested
- ND = None detected, no established detection limits

If you have any questions regarding the results contained within, feel free to directly contact the chemist who performed the analysis. We appreciate this opportunity to be of service and look forward to your continued patronage.

Sincerely,

Lorraine Olashaw

Lorraine Olashaw
QA/QC Coordinator

LABORATORY REPORT

Eastern Analytical, Inc. Designation: 2382B DUF

Client: Dufresne-Henry
Sample Qty/Type: 6 aqueous

Client Designation: 2017 Bridge St
Date Received: August 15, 1991

Hazardous Substance List Volatile Organic Compounds

Sample ID:	MW8	MW11	MW10	MW9	MW2	MW1	
Matrix:	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	Aqueous	
Date of Analysis:	8/24/91	8/24/91	8/24/91	8/24/91	8/24/91	8/24/91	
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	EPA
Analyst:	WB	WB	WB	WB	WB	WB	Method
Dilution Factor:	1	1	1	1	1	10	
Chloromethane	< 5	< 5	< 5	< 5	< 5	< 50	601
Bromomethane	< 5	< 5	< 5	< 5	< 5	< 50	601
Vinyl Chloride	< 5	< 5	< 5	< 5	< 5	< 50	601
Chloroethane	< 5	< 5	< 5	< 5	< 5	< 50	601
Methylene Chloride	< 2	< 2	< 2	< 2	< 2	< 20	601
Carbon Disulfide	< 2	< 2	< 2	< 2	< 2	< 20	601
1,1-Dichloroethene	< 2	< 2	< 2	< 2	< 2	< 20	601
1,1-Dichloroethane	< 2	< 2	< 2	< 2	< 2	< 20	601
Trans-1,2-Dichloroethene	< 2	< 2	< 2	< 2	< 2	< 20	601
Cis-1,2-Dichloroethene	< 2	< 2	< 2	< 2	< 2	< 20	601
Chloroform	< 2	< 2	< 2	< 2	< 2	< 20	601
1,2-Dichloroethane	< 2	< 2	< 2	< 2	**13**	**40**	601
1,1,1-Trichloroethane	< 2	< 2	< 2	< 2	< 2	< 20	601
Carbon Tetrachloride	< 2	< 2	< 2	< 2	< 2	< 20	601
Bromodichloromethane	< 2	< 2	< 2	< 2	< 2	< 20	601
1,2-Dichloropropane	< 2	< 2	< 2	< 2	< 2	< 20	601
Trans-1,3-Dichloropropene	< 2	< 2	< 2	< 2	< 2	< 20	601
Trichloroethene	< 2	< 2	< 2	< 2	< 2	< 20	601
Dibromochloromethane	< 2	< 2	< 2	< 2	< 2	< 20	601
1,1,2-Trichloroethane	< 2	< 2	< 2	< 2	< 2	< 20	601
Cis-1,3-Dichloropropene	< 2	< 2	< 2	< 2	< 2	< 20	601
2-Chloroethylvinylether	< 2	< 2	< 2	< 2	< 2	< 20	601
Bromoform	< 2	< 2	< 2	< 2	< 2	< 20	601
Tetrachloroethene	< 2	< 2	< 2	< 2	< 2	< 20	601
1,1,2,2-Tetrachloroethane	< 2	< 2	< 2	< 2	< 2	< 20	601
Acetone	< 10	< 10	< 10	< 10	< 10	< 100	8015
2-Butanone (MEK)	< 10	< 10	< 10	< 10	< 10	< 100	8015
Vinyl Acetate	< 10	< 10	< 10	< 10	< 10	< 100	8015
4-Methyl-2-Pentanone (MIBK)	< 10	< 10	< 10	< 10	< 10	< 100	8015
2-Hexanone	< 10	< 10	< 10	< 10	< 10	< 100	8015
Benzene	< 1	**2**	**79**	**12**	**340**	**2,800**	602
Toluene	< 1	< 1	**8**	< 1	**17**	**340**	602
Ethylbenzene	< 1	< 1	**2**	< 1	**90**	**50**	602
Total Xylenes	< 1	**2**	**15**	**4**	**350**	**1,200**	602
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 10	602
Styrene	< 1	< 1	< 1	< 1	< 1	< 10	602
Volatile Petroleum Hydrocarbons (C4-C7)	< 20	< 20	**100**	**500**	**500**	**5,000**	8015
(C8-C10)	< 20	< 20	**200**	< 20	**100**	**2,000**	8015
(C11-C16)	< 20	< 20	**2,000**	**50**	**5,000**	**10,000**	8015

Approved By : _____

Timothy Schaper, Organics Supervisor

Eastern Analytical, Inc. 130 Hall St., Concord, NH 03301 (603) 228-0525

January 25, 1991

Ted Reeves
Dufresne-Henry
Precision Park
North Springfield, VT 05150

Sample Identification:
Client ID: 160017/Johnson & Dix
Sample Qty/Type: 7 aqueous
Date Recv'd: January 4, 1991
EAI ID: 1309 DUF

Dear Mr. Reeves:

Enclosed, please find the results of the analysis of the sample(s) identified above. This report contains the following sections:

ANALYSIS TYPE	NO. OF PAGES
• Hazardous Substance List (HSL) VOCs	1
• Organics	1

The following standard abbreviations and conventions apply throughout all Eastern Analytical, Inc. reports:

- < = "Less than" followed by the detection limit
- TNR = Testing Not Requested
- ND = None detected, no established detection limits

If you have any questions regarding the results contained within, feel free to directly contact the chemist who performed the analysis. We appreciate this opportunity to be of service and look forward to your continued patronage.

Sincerely,

William Brunkhorst
QA/QC Coordinator

LABORATORY REPORT

Eastern Analytical, Inc. Designation: 1309 DUF

Client: Dufresne-Henry
Sample Qty/Type: 7 aqueous

Client Designation: 160017/Johnson & Dix
Date Received: January 4, 1991

Hazardous Substance List Volatile Organic Compounds

Sample ID:	0103-1	0103-2	0103-3	0103-4	0103-5	0103-6	0103-7	
Matrix:	Aqu.	Aqu.	Aqu.	Aqu.	Aqu.	Aqu.	Aqu.	
Date of Analysis:	1/15/91	1/15/91	1/15/91	1/15/91	1/15/91	1/15/91	1/15/91	
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	EPA
Analyst:	NZ	NZ	NZ	NZ	NZ	NZ	NZ	Method
Dilution factor:	1	1	100	1	100	1	1	
Chloromethane	< 5	< 5	< 500	< 5	< 500	< 5	< 5	624
Bromomethane	< 5	< 5	< 500	< 5	< 500	< 5	< 5	624
Vinyl Chloride	< 5	< 5	< 500	< 5	< 500	< 5	< 5	624
Chloroethane	< 5	< 5	< 500	< 5	< 500	< 5	< 5	624
Methylene Chloride	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Acetone	< 10	< 10	< 1000	< 10	< 1000	< 10	< 10	624
Carbon Disulfide	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
1,1-Dichloroethene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
1,1-Dichloroethane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Trans-1,2-Dichloroethene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Cis-1,2-Dichloroethene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Chloroform	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
1,2-Dichloroethane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
2-Butanone (MEK)	< 10	< 10	< 1000	< 10	< 1000	< 10	< 10	624
1,1,1-Trichloroethane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Carbon Tetrachloride	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Vinyl Acetate	< 10	< 10	< 1000	< 10	< 1000	< 10	< 10	624
Bromodichloromethane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
1,2-Dichloropropane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Trans-1,3-Dichloropropene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Trichloroethene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Dibromochloromethane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
1,1,2-Trichloroethane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Benzene	**2,300**	**2**	**5,200**	< 1	**800**	< 1	< 1	624
Cis-1,3-Dichloropropene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
2-Chloroethylvinylether	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Bromoform	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
4-Methyl-2-Pentanone (MIBK)	< 10	< 10	< 1000	< 10	< 1000	< 10	< 10	624
2-Hexanone	< 10	< 10	< 1000	< 10	< 1000	< 10	< 10	624
Tetrachloroethene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
1,1,2,2-Tetrachloroethane	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Toluene	**840**	< 1	< 100	< 1	< 100	< 1	< 1	624
Chlorobenzene	< 2	< 2	< 200	< 2	< 200	< 2	< 2	624
Ethylbenzene	**950**	< 1	**4,100**	< 1	**200**	< 1	< 1	624
Styrene	< 1	< 1	< 100	< 1	< 100	< 1	< 1	624
Total Xylenes	**2,000**	**2**	**11,000**	< 1	**2,000**	< 1	< 1	624
Volatile Petroleum Hydrocarbons (C4-C13)	**5,000**	**500**		< 20			< 20	624
(C4-C16)			**200,000**		**500,000**			624
(C10-C13)						**500**		624

Approved By :

William Brunkhorst, Organics Supervisor

ABORATORY REPORT

Eastern Analytical, Inc. Designation: 1309 DUF

Client: Dufresne-Henry
Sample Qty/Type: 5 aqueous

Client Designation: **160017/Johnson & Dix**
Date Received: January 4, 1991

Organics

Sample ID: / Matrix:	1A Aqueous	2A Aqueous	4A Aqueous	6A Aqueous	7A Aqueous	Date of Analysis	Analyst	EPA Method
Organics: (mg/L)								
Total Petroleum Hydrocarbons	8	< 5	< 5	< 5	< 5	1/18/91	LB	418.1

Approved By : Lorraine Olashaw

Lorraine Olashaw, Inorganics Supervisor

APPENDIX F

ANALYSIS SUMMARY TABLES

BRIDGE STREET ANALYSIS RESULTS SUMMARY TABLE

JANUARY 3, 1991 SAMPLES

MONITORING WELL # / PARAMETER *	MW#1	MW#2	MW#3	MW#4	MW#5	MW#6	MW#7	SDWA
BENZENE	2300	2	5200	BDL	800	BDL	BDL	5
TOLUENE	840	BDL	BDL	BDL	BDL	BDL	BDL	2000
ETHYLBENZENE	950	BDL	4100	BDL	200	BDL	BDL	700
TOTAL XYLENES	2000	2	11000	BDL	2000	BDL	BDL	10000
TOTAL BTEX	6090	4	20300	0	3000	0	0	
VOLATILE PETROLEUM HYDROCARBONS C4–C13	5000	500						
C4–C16			200000		500000			
C10–C13						500		
TOTAL TVPH	5000	500	200000	0	500000	500	0	
FREE PRODUCT (INCHES)			2.5		0.75			

* ALL CONCENTRATIONS IN uG/L (PARTS PER BILLION).

NOTE: SHADED VALUES EXCEED SAFE DRINKING WATER ACT (SDWA) LEVELS

BDL = BELOW DETECTION LIMITS

BRIDGE STREET ANALYSIS RESULTS SUMMARY TABLE

AUGUST 13, 1991 SAMPLES

MONITORING WELL # / PARAMETER *	MW#1	MW#2	MW#8	MW#9	MW#10	MW#11	SDWA
BENZENE	2800	340	BDL	12	79	2	5
TOLUENE	340	17	BDL	BDL	8	BDL	2000
ETHYLBENZENE	50	90	BDL	BDL	2	BDL	700
TOTAL XYLENES	1200	350	BDL	4	15	2	10000
TOTAL BTEX	4390	797	0	16	104	4	
VOLATILE PETROLEUM HYDROCARBONS							
C4–C7	5000	500	BDL	500	100	BDL	
C8–C10	2000	100	BDL	BDL	200	BDL	
C11–C16	10000	5000	BDL	50	2000	BDL	
TOTAL TVPH	17000	5600	0	550	2300	0	
FREE PRODUCT (INCHES)							

* ALL CONCENTRATIONS IN uG/L (PARTS PER BILLION)

NOTE: SHADED VALUES EXCEED SAFE DRINKING WATER ACT (SDWA) LEVELS

BDL = BELOW DETECTION LIMITS